

PAGE'S WEEKLY

A Weekly Journal Devoted to the Engineering, Iron and Steel,
Mining, Electrical, and Shipbuilding Industries.

OFFICES: CLUN HOUSE, SURREY STREET, STRAND, LONDON, W.C.

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LONDON, FRIDAY, FEBRUARY 16, 1906.

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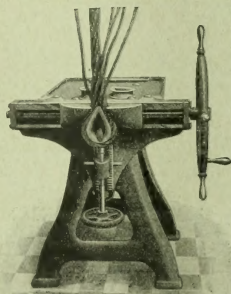
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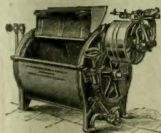
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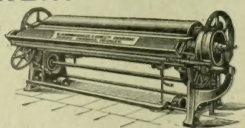
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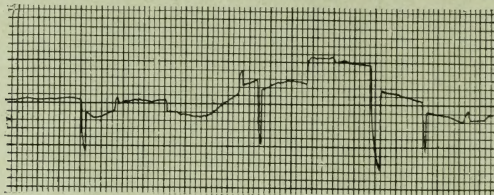
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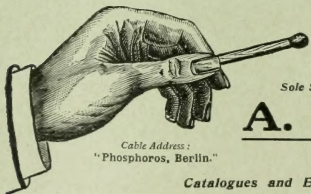


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which was actually taken in a BLAST FURNACE and shows the variation of TEMPERATURE in the MAIN. Observe the rapid fall of temperature when the Blast is shut off, and the instantaneous rise on readmission. The portion of record reproduced extends over about 22 hours, each space on the vertical scale corresponding to 8 Fahrenheit degrees.

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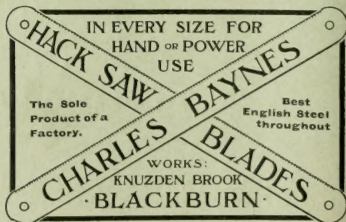
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OF ALL DESCRIPTIONS.

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PAGE'S WEEKLY

Miscellaneous

Mr. G. H. HUGHES, M.I.Mech.E.,

Consulting and Organising Engineer for Water Works and Industrial Undertakings,
19, OLD QUEEN ST., WESTMINSTER, S.W.
Telephone No.: 5751 Bank. Write for particulars.

PATENTS.

Mr. J. G. LORRAIN, M.I.E.E., M.I.Mech.E., Fellow of the Chartered Institute of Patent Agents,
NORFOLK HOUSE, NORFOLK STREET, STRAND, LONDON, W.C.
"PATENTEE'S HANDBOOK," post free on application, gives Full Information to Inventors and upon all the chief points of the Patent Law.
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SAW GUARDS, BENCHES, SHARPENERS.

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READY FOR PROMPT DELIVERY.

| | Size. | Working Pressure. |
|----------------------|-----------------------|-------------------|
| One Thompson Boiler, | 30 ft. by 8 ft. 6 in. | for 160 lb. |
| Three " " | 30 ft. " 8 ft. 6 in. | " 120 lb. |
| One " " | 30 ft. " 8 ft. 6 in. | " 120 lb. |
| Three " " | 30 ft. " 8 ft. | " 120 lb. |
| Six " " | 30 ft. " 8 ft. | " 100 lb. |
| One " " | 28 ft. " 7 ft. | " 140 lb. |
| One Cornish " " | 20 ft. " 5 ft. | " 100 lb. |

All sizes of Vertical Boilers from 2 to 20 n.h.p.

JOHN THOMPSON, Wolverhampton.

Bogie Locomotives for Short Curves. A large number of these Engines have been built to NARROW and to NORMAL GAUGE.—For full particulars, and for Licences, &c., address the HAGAN'S LOCOMOTIVE WORKS, ERFURT, GERMANY.

Melville and Macalpine, Consulting Engineers and NAVAL ARCHITECTS.

815, WALNUT STREET, PHILADELPHIA, PA., U.S.A.
Rear-Admiral GEORGE W. MELVILLE, Ex-Engineer-in-Chief of the United States Navy, and JOHN H. MACALPINE, having a very extensive acquaintance in the best engineering circles in the United States, Britain, and the Continent of Europe, especially SOLICIT INTERNATIONAL BUSINESS.

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BONUS TABLES. For calculating wages on the Bonus or Premium system. By HENRY A. GOLDING, A.M.I.Mech.E. Cloth, 7s. 6d. net.

"We have much pleasure in recommending this volume as being of great assistance."—*Page's Magazine*.

OIL FUEL: Its Supply, Composition, and Application. By SIDNEY H. NORTH, in large 8vo. Fully illustrated. 5s. net.

"Everyone interested in this important question will welcome Mr. North's excellent text book."—*Nature*.

A HANDBOOK ON PETROLEUM.

For Inspectors under the Petroleum Acts, and for those engaged in the Storage, Transport, Distribution, and use of petroleum, and its products. By Captain J. H. THOMSON and Sir ROBERTON REDWOOD, with plates and illustrations. 8s. 6d. net.
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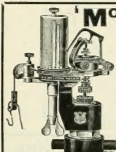
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Consulting and Mining Engineer for Ore Dressing Plants of All Classes.

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By EWING MATHESON, M.Inst.C.E.

The Principles which should guide the Writing off for wear and tear, Obsolete plant; Terminable or wasting properties; Effect on Income-tax; Value defined as for Compulsory purchase; Going concern or dismantled; Rateable value, rental value.

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Firewood Splitting and Bundling Machines.

Does 100 Men's Work. Old Timber utilised. 1 to 3 tons per hour.



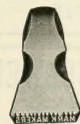
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STEAM BOILERS: Their Defects, Management, and Construction.

By R. D. MUNRO, Chief Engineer to the Scottish Boiler and Engine Inspection Company. Fourth edition. Fully illustrated. 4s. 6d.

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VALVES AND VALVE-GEARING.

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"As a practical treatise on the subject, the book stands without a rival."

—*Mechanical World*

London: CHARLES GRIFFIN & CO., Ltd., 12 Exeter St., Strand, W.C.

PAGE'S WEEKLY

Contracts

CONTRACTS.

COUNTY BOROUGH OF WARRINGTON.

The Water Committee is prepared to receive TENDERS for the SUPPLY of the following MATERIALS, for a period of twelve months from April 1st next.

- Section No. 1.—PIPES, CASTINGS, VALVES, HYDRANT COVERS, &c.
Section No. 2.—JIB, STOP and BALL COCKS, FERRULES, &c.
Section No. 3.—OILS.
Section No. 4.—CARTING.

Specifications and Form of Tender may be obtained from the Water Engineer, Municipal Offices, Sankey Street, on payment of 1s. per section, which will be returned on receipt of a *bona fide* Tender.

The contractors whose Tenders are accepted will be required to observe the recognised customs and conditions as to rate of wages and working hours prevailing within the district.
Tenders, in securely fastened envelopes, endorsed "Tender for Material, Section No. —," and addressed to "The Chairman, Water Committee, Town Hall, Warrington," to be delivered not later than 10 a.m. on Saturday, February 24th, 1906.

The lowest or any Tender will not necessarily be accepted.
J. LYON WHITTLE, Town Clerk.

THE SECRETARY OF STATE FOR INDIA IN COUNCIL is prepared to receive TENDERS from such persons as may be willing to SUPPLY—

1. WHEELS and AXLES.
2. BUFFERS for WAGONS.
3. BEARING SPRINGS for WAGONS.
4. SPIRAL and VOLUTE SPRINGS for WAGONS.

The Conditions of Contract may be obtained on application to the Director-General of Stores, India Office, Whitehall, S.W., and Tenders are to be delivered at that office by Two o'clock p.m. on Tuesday, the 20th February, 1906, after which time no Tender will be received.

E. GRANT BURLS, Director-General of Stores.
India Office, Whitehall, February 17th, 1906.

MINERAL OIL CONTRACT.

The Commissioners of Irish Lights hereby give notice that they are prepared to receive TENDERS for the SUPPLY and DELIVERY at certain Ports round Ireland of 25,000 Imperial gallons, more or less, of the FINEST QUALITY HEAVY MINERAL OIL, in such quantities as may be required from time to time during the twelve months ending March 31st, 1907.

Forms of Tender and Specification can be obtained on application to the undersigned.

Tenders, sealed, addressed to "The Secretary, Irish Lights Office, Dublin," and endorsed "Tender for Heavy Mineral Oil," should be posted so as to reach this office not later than noon on Thursday, February 22nd, 1906.

The Commissioners will only give consideration to such Tenders as are submitted on their forms, and will not bind themselves to accept the lowest or any Tender.

Firms desirous of tendering are requested to note that a sample of Five Gallons of the Oil proposed to be supplied must be forwarded so as to reach this office not later than one clear week in advance of the date named herein for the receipt of the Tenders.

The vessel containing the Sample is to bear an easily recognised distinguishing mark, which mark is to be repeated in the Tender for the purpose of identification, but under no circumstances is the name, trade, or private mark of the firm to appear on the vessel.

By order, HUBERT G. COOK, Secretary.

PONTYPRIDD URBAN DISTRICT COUNCIL.

The Urban District Council of Pontypridd are prepared to receive TENDERS for the following—

- Section K.—RESERVOIR.
Section L.—CONDENSING PLANT, COOLING TOWER, and TANK.

Section U.—ARTESIAN WELL.
Specifications, Conditions, and Form of Tender, may be obtained on and after the 14th inst. at the offices of the Consulting Engineer, Mr. REGINALD P. WILSON, 66, Victoria Street, Westminster, or at the Council Offices, Pontypridd, on payment of the sum of Three Guineas for each section.

This sum is required as a deposit, and will, after the Council shall have entered into a contract upon the Tenders received, but not before, be returned to the tenderer, provided he shall have sent in a *bona fide* Tender, and shall not have withdrawn the same. In any other case the deposit will be forfeited.

The Tender must be sent in on the official form, and all instructions contained therein must be carefully complied with.
Tenders, endorsed "Section K.—Reservoir," "Section L.—Condensers," or "Section U.—Artesian Well," must be addressed to the Clerk of the Pontypridd Urban District Council, and must be delivered at the Council Offices, Pontypridd, not later than 12 noon on Saturday, March 3rd, 1906.

The Council do not bind themselves to accept the lowest or any Tender.
J. COLENSO JONES, Clerk to the Council.

Council Offices, Pontypridd.

MUNICIPAL COUNCIL OF SYDNEY, N.S.W.

ELECTRICITY DEPARTMENT.
The Council is prepared to receive TENDERS for the SUPPLY and ERECTION OF—

- A. BOILERS, AUTOMATIC STOKERS, PIPEWORK, &c.
B. TURBO-ALTERNATOR, SUB-STATION MACHINERY, SWITCHBOARDS.

Specifications, Plans, and Form of Tender may be obtained on application to Mr. T. ROOKE, at the offices of Messrs. Preece and Cardew, 8, Queen Anne's Gate, Westminster, on and after Monday, February 13th. A deposit of Five Guineas will be required on application, which will be refunded on receipt of a *bona fide* Tender as directed, and a cash deposit or marked cheque for the sum of £1,000 will be required when the Tender is sent in.

Sealed Tenders, endorsed "Tender for Electric Lighting Plant," are to be addressed to the Town Clerk, Town Hall, Sydney, and must be delivered at the Town Hall on or before 4 p.m. Monday, May 7th, 1906.

The Council does not bind itself to accept the lowest or any Tender.
(Signed) THOMAS H. NESBITT, Town Clerk.

NOTICE TO CONTRACTORS.

The CAVAN COUNTY COUNCIL invite TENDERS for a STEAM TRACTION ENGINE, the Specification for which may be obtained from the County Surveyor, Albarr, Cavan.

Tenders will be received on or before the 23rd inst., and are to be addressed to "The Chairman, Co. Cavan, Cavan."

BECKENHAM URBAN DISTRICT COUNCIL.

TO WELL SINKERS.
The Beckenham Urban District Council invite TENDERS for SINKING a BOREHOLE at their Electric Light Works.

The borehole will be sunk into the chalk strata, and will be lined with steel tubing.

Specifications and Forms of Tender obtained on application to Mr. JOHN A. ANGELL, Surveyor, on and after February 13th, on the production of a receipt from the Collector (who attends his office daily from 9 a.m. to 4 p.m., only, except on Tuesdays, when his hours are from 9 a.m. to 5 p.m.) for a deposit of £1, which will be returned on the receipt of a *bona fide* Tender.

Tenders duly sealed and endorsed "Tenders for Well Sinking," to reach undersigned not later than 4 p.m. Monday, February 19th, 1906.

The Council do not bind themselves to accept the lowest or any Tender.

(By order) F. STEVENS, Clerk to the Council.

COUNTY OF LONDON.—

TO ENGINEERS AND OTHERS.

The London County Council invites TENDERS for the MANUFACTURE, SUPPLY, and ERECTION OF THREE GAS ENGINES, each having three inverted single-acting cylinders over three cranks, and each capable of developing 350 brake horse-power at a speed of 100 revolutions per minute.

Persons desirous to submit Tenders may obtain the Drawing, Specification, Form of Tender, and other particulars upon application to the Chief Engineer, Mr. MAURICE FITZMAURICE, C.M.G., at the County Hall, Spring Gardens, S.W., upon payment to the Cashier of the Council of the sum of £2.

This amount will, after the Council or its Committee have come to a decision upon the Tenders received, be returned to the tenderer, provided he shall have sent in a *bona fide* Tender, and not have withdrawn the same.

Tenders must be upon the official Forms, and the printed instructions contained therein must be strictly complied with.

The Contractors will be bound by the Contract to pay to all workmen (except a reasonable number of legally bound apprentices) employed by them wages at rates not less, and to observe hours of labour not greater, than the rates and hours set out in the Council's list, and such rates of wages and hours of labour will be inserted in, and form part of the Contract by way of schedule.

Each Tender is to be delivered at the County Hall in a sealed cover addressed to "The Clerk of the London County Council, Spring Gardens, S.W.," and marked "Tender for Gas Engines, Shad Thames Pumping Station."

No Tender will be received after 10 a.m. on Tuesday, February 20th, 1906.

Any Tender which does not comply with the printed instructions for Tender may be rejected.

The Council does not bind itself to accept the lowest or any Tender, and it will not accept the Tender of any person or firm who shall on any previous occasion have withdrawn a Tender after the same had been opened, unless the reasons for the withdrawal were satisfactory to the Council.

G. L. GOMME, Clerk of the London County Council.

County Hall, Spring Gardens, S.W.,
January 16th, 1906.

PAGE'S WEEKLY

Contracts and Appointments Open

EAST INDIAN RAILWAY.—The East Indian Railway Company is prepared to receive TENDERS for the SUPPLY and DELIVERY of PIG IRON as per specification to be seen at the Company's Offices.

Tenders are to be sent to the undersigned, marked "Tender for Pig Iron," not later than Twelve o'clock noon on Wednesday, the 22nd day of February instant.

The Company reserves to itself the right to divide the order, also to decline any Tender without assigning a reason, and does not bind itself to accept the lowest or any Tender.

For each Specification a fee of £1 is charged, which cannot under any circumstances be returned.

By order,
C. W. YOUNG, Secretary.

Nicholas Lane, London, E.C.,
February 8th, 1906.

BRADFORD POOR LAW UNION.—The

Guardians of the Bradford Poor Law Union are prepared to receive TENDERS from Messrs. and Builders for the erection of PUMP-ROOM and STEAM-BOILER CHIMNEY, also TENDERS from Heating Engineers for the INSTALLATION of a SYSTEM of ATMOSPHERIC STEAM HEATING and MACHINERY in connection therewith, at the Union Hospital, Horton Lane, Bradford.

Contractors desirous of tendering for these Works are requested to forward their applications, along with a deposit of £25, for each separate Contract (which will be returned on receipt of *bona fide* Tender), to Mr. Fred Holland, Engineer and Architect to the Board, 15, Parkinson's Chambers, Hustlergate, Bradford (Tel. No. 1,539), when particulars will be forwarded in due course. Drawings and Specifications may be seen at the Architect's Offices.

Sealed Tenders, on separate Forms of Tender supplied, to be endorsed "Pump-Room," "Chimney," "Atmospheric Heating," to be delivered to the undersigned not later than 9 a.m. on Monday, the 20th day of February, 1906.

The lowest of any Tender will not necessarily be accepted, and the Tender of any person or firm who does not observe the fair contracts clauses referred to in specification will not be accepted.

By order,
GEORGE M. CROWTHER, Clerk to the Guardians.

Union Offices, 22, Manor Row, Bradford
January 18th, 1906.

BOROUGH OF DOVER.—ELECTRICITY DEPARTMENT.—ENGINES.

The Corporation invite TENDERS for the SUPPLY and ERECTION of One 350-kilowatt COMBINED STEAM GENERATOR "ET for Traction purposes. The Engine to be of the High-Speed Vertical Compound Knechtel type with Forced Lubrication. The time of delivery will be an essential feature of the Contract.

Copies of the Specification and Forms of Tender may be obtained from Mr. L. W. WOODMAN, Borough Electrical Engineer, Park Street, Dover, upon a deposit of One Guinea, which will be returned in respect of each *bona fide* Tender that is not accepted. Additional copies of Specification, 2s. 6d. each.

Sealed Tenders, on the prescribed form, to be addressed and delivered to me, and endorsed "Tender for Steam Generator," on or before February 12th, 1906.

The Contractor to enter into a contract and bond, with two approved sureties, for the completion.

The Corporation do not bind themselves to accept the lowest or any Tender.

WOLLASTON KNOCKER, Town Clerk.

Castle Hill House, Dover,
January 23rd, 1906.

COUNTY BOROUGH OF SUNDERLAND.—ELECTRICITY DEPARTMENT.

TO MANUFACTURERS OF FEED PUMPS, COOLING TOWERS, AND SURFACE CONDENSERS.

The Corporation of Sunderland are prepared to receive TENDERS for the SUPPLY of—

- ONE BOILER FEED PUMP.
- ONE WOODEN COOLING TOWER.
- ONE SURFACE CONDENSER with Motor-Driven Pumps.
- COAL BUNKERS, GANTRY, and other Steelwork.

The Specifications and Forms of Tender can be obtained on application to the Borough Electrical Engineer, Mr. J. F. C. Sudd, M.Inst. C.E., at his office, Town Hall, Sunderland, and on payment of £1 is. (One Guinea) for each Specification, which will be returned on receipt of a *bona fide* Tender.

Sealed Tenders, addressed to the "Chairman of the Electricity and Lighting Committee," Town Hall, Sunderland, must be delivered at my office not later than 12 o'clock noon on Friday, the second day of March, 1906. Tenders to be endorsed "A, B, C, or D," according to item tendered for.

The Corporation do not bind themselves to accept the lowest or any Tender.

FRAS. M. BOWEY, Town Clerk.

Town Hall, Sunderland, January 22nd, 1906.

THE MADRAS RAILWAY COMPANY

REQUIRE, for their Locomotive Workshops in India, the SERVICES of THREE fully qualified MEN, to fill the vacancies mentioned below.

Free passage to Madras.

Engagement for four years.

Candidates, preferably unmarried, must not be older than 30, and have a good practical knowledge of modern workshop practice, with high-speed machine tools, and possess the following qualifications—

MILLWRIGHT FOREMAN.—He must be able to superintend the erection and maintenance of all machine tools, and be competent to make fully dimensioned rough detail drawings. Pay, 350, rising to 400 rupees per month.

ASSISTANT MACHINE SHOP FOREMAN.—He must have had a practical training and several years' experience in a modern machine shop; he must also be conversant with both piecework and premium system of payments. Pay, 275, rising to 325 rupees per month.

ASSISTANT FOUNDRY FOREMAN.—In addition to having a good knowledge of iron and brass founding, he must be sufficiently conversant with patternmaking to direct native workmen in cylinder and other work. Pay, 275, rising to 325 rupees per month.

Applications, stating age, past employments, &c., to be addressed to the Secretary, Madras Railway Company, 1, Broad Street Place, London, E.C., not later than February 26th, 1906.

February 1st, 1906.

APPOINTMENTS OPEN.

INDIAN PUBLIC WORKS DEPARTMENT.

The Secretary of State for India in Council will, in the Summer of 1906, make not less than TEN APPOINTMENTS of ASSISTANT ENGINEER in the Permanent Establishment of the Indian Public Works Department, in addition to the appointments to be made from Cooper's Hill College.

The age of Candidates must not be less than 21, or more than 24 years on the 1st July, 1906.

A printed Form of Application, together with information regarding the conditions of the appointments and certain requirements laid down as to education and experience in engineering, may be obtained from the Secretary, Public Department, India Office, Whitehall, London, S.W.

The Form of Application is to be returned so as to reach him not later than Tuesday, 1st May next.

A. GODLEY, Under Secretary of State.

India Office, December 16th, 1905.

CITY AND COUNTY BOROUGH OF CHESTER. SEWAGE DISPOSAL WORKS—SUPERINTENDENT.

THE CHESTER CORPORATION invite applications for the APPOINTMENT of a SUPERINTENDENT to have the control and management of the New Sewage Disposal Works, including Steam Engines, Gas Engines, Producer Gas Plant, and the usual mechanical appliances common to a modern Sewage Disposal Installation.

Applicants to be trained mechanical engineers and to have a competent knowledge of chemistry (inorganic and organic) and the elementary analysis of water.

The salary will be £150 per annum.

Applications, stating age, qualifications, and experience, and accompanied by not more than three recent testimonials, to be sent to me not later than Saturday, February 24th, 1906, endorsed "Superintendent."

Canvassing, either directly or indirectly, will be a disqualification.

J. H. DICKSON, Town Clerk.

Town Hall, Chester,
February 5th, 1906.

STAFFORD RURAL DISTRICT COUNCIL. CLERK OF WORKS.

The Rural District Council of Stafford require the services of a CLERK OF THE WORKS, to act under the instructions of their Engineers, Messrs. R. E. W. BERRINGTON and SON, during the construction of Sewerage Works for the Parishes of Tillington and Castle Church.

Candidates must have had previous experience in similar work, and be capable of taking and giving levels, measuring up work, &c.

Salary, £3 per week; duration of contract about nine months. Applications, on separate forms, accompanied by references, stating age and experience, and enclosing copies of not more than two recent testimonials, are to be sent to me, the undersigned, endorsed "Clerk of Works," on or before March 1st, 1906.

Canvassing will be a disqualification.

WILLIAM MORGAN, Clerk to the Council.

Council Offices, 4, Martin Street, Stafford,
January 30th, 1906.

Buyers' Directory.

NOTE—The display advertisements of the firms mentioned under each heading can be found readily by reference to the Alphabetical Index to Advertisers on pages 35, 37, 38, and 39.

In order to assure fair treatment to advertisers, each firm is indexed under its leading specialty ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

Advertisers' Service Bureau.

British Advertiser Service Bureau, Queen Anne's Chambers, Westminster, S.W.

Artesian Well Machinery.

John Z. Thom, Patricroft, Manchester.

Band Sawing Machines.

Noble & Lund, Ltd., Felling-on-Tyne.

Bearings (Roller).

Hyatt Roller Bearing Co., 47, Victoria Street, London S.W.

Belting.

Binney & Son, Catherine Street, City Road, London, E.C.

Cort, Arthur, & Co., Camberwell, London, S.E.

Fleming, Kirkby & Goodall, Ltd., West Grove, Halifax.

Gilmour, W. & O., St. John's Hill, Edinburgh.

Boilers.

Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.

Hartley & Sugden, Ltd., Halifax.

Thompson, John, Wolverhampton.

Boilers (Water-tube).

Babcock & Wilcox, Ltd., Oriol House, Farringdon Street London, E.C.

Stirling Boiler Co., Ltd., Motherwell, N.B.

Bolts, Nuts, Rivets, etc.

Herbert W. Periam, Ltd., Floodgate Street Works, Birmingham.

T. D. Robinson & Co., Ltd., Derby.

Books.

Griffin, Charles, & Co., Exeter Street, Strand, W.C.

New Zealand Mines Record, Wellington, New Zealand.

Spon, E. & F. N., 125, Strand, W.C.

Boring Machines.

Asquith, William, Ltd., Well Road Works, Halifax.

Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Noble & Lund, Ltd., Felling-on-Tyne.

Cables.

Callender's Cable and Construction Co., Ltd.

Case-Hardening Compounds.

Hy. Miller & Co., Millgate Works, Leeds.

Casings.

Asmire, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Catalogues, Printing, &c.

Atlantic Press, Ltd., Weymouth Street, Manchester.

Spottiswoode Advertising Agency, Clun House, Surrey Street, Strand, W.C.

Stallord, Arthur, & Co., Denton, Manchester.

Chucks.

Fairbanks Co., 78-80, City Road, London, E.C.

Cisterns, Tanks, &c.

Asmire, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Clayton, Son & Co., Ltd., Hunslet, Leeds.

F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Clutches (Friction).

David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.

Condensing Plant.

Benn, Sykes, Haslingden, near Manchester.

Concentric Condenser, Ltd., 23, Northumberland Avenue, London, W.C.

Mirrlees-Watson & Co., Ltd., Glasgow

Consulting Engineers.

Gibbs, John, & Son, 80, Juke Street, Liverpool.

G. H. Hughes, A.M.I.M.E., 19, Old Queen Street, Westminster, S.W.

Mellville & Macalpine, 615, Walnut Street, Philadelphia, Pa., U.S.A.

Mount-Haes, A., M.I.Mech.E., M.I.M.E., 11, Ironmonger Lane, London, E.C.

Continental Railway Arrangements.

Northern Railway of France.

South Eastern & Chatham Railway Co.

Conveying and Elevating Machinery.

Adolf Bleichert & Co., Leipzig-Gohlis, Germany.

Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Temperley Transporter Co., 72, Bishopsgate Street Within, London, E.C.

Copper and Brass.

W. Hepton & Son, Hunslet Lane, Leeds

Coverings (Boiler).

Magnesia Covering Ltd., Washington Station, Co. Durham.

Cranes, Travellers, Winches, etc.

Joseph Booth & Rodley, Ltd., Rodley, Leeds.

Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Cranks.

Clarke's Crank & Forge Co., Ltd., Lincoln, England.

Cutters (Milling).

Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.

E. G. Wrigley & Co., Ltd., Foundry Lane Works, Soho, Birmingham.

Destructors.

Heenan & Froude, 4, Chapel Walks, Manchester.

Horsfall Destructor Co., Ltd., Armley, Leeds.

Dredges and Excavators.

Delange & Cie, Mee, Hoboken, near Antwerp.

Rose, Downs & Thompson, Ltd., Old Foulwy, Hull.

Drilling Machines.

Asquith, William, Ltd., Well Road Works, Halifax.

Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Noble & Lund, Ltd., Felling-on-Tyne

Swift, George, Clarence Ironworks, Halifax.

Economisers.

E. Green & Son, Ltd., Manchester.

Ejectors (Pneumatic).

Hughes & Lancaster, 16, Victoria Street, London, S.W.

Electrical Apparatus.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.

British Westinghouse Electric and Manufacturing Co., Ltd., Norfolk

Street, Strand, London, W.C.

Broadbent, T. W., Victoria Electrical Works, Huddersfield.

Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey Street, London, S.E.

Ebonestos Manufacturing Co., 22, Rosoman Street, London, E.C.

Gent & Co., Ltd., Faraday Works, Leicester.

Greenwood & Batley, Ltd., Albion Works, Leeds.

India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., Silvertown, London, E.

Johnson and Phillips, Ltd., Swinton Works, Old Charlton, Kent.

Kilbaths & Yates, Ltd., Victoria, Manchester.

Mix and Genest, Berlin, W., Germany.

Nalder Bros. & Thompson, 34, Queen Street, London, E.C.

New Gutta Percha Co., Ltd., Dushwood House, New Broad Street, E.C.

Newton Brothers, Full Street, Derby.

Phoenix Dynamo Manufacturing Co., Bradford, Yorks.

Scott, E., & Mountain, Ltd., Newcastle-on-Tyne.

Turner, Albertson & Co., Ltd., Denton, Manchester.

W. Weaver & Co. (see Ebonestos Manufacturing Co.), 22, Rosoman Street, Clerkenwell, London, E.C.

Engineers' Supplies.

Ablers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Engines (Gas).

Campbell Gas Engine Co., Ltd., Halifax.

Cundall, Son & Co., Ltd., Airedale Iron Works, Shipley.

Engines (Electric Lighting).

McLaren, J. and H., Midland Engine Works, Leeds.

Engines (Locomotive).

Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.

Hunslet Engine Co., Ltd., Leeds, England.

Huwel, Clarke & Co., Ltd., Leeds, England.

McLaren, J. and H., Midland Engine Works, Leeds.

Engines (Stationary).

Alfa-Chalmers Co., 533, Salisbury House, Finsbury Circus, London, E.C.

Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Mirrlees-Watson Co., Ltd., Glasgow.

Engines (Traction).

John Fowler & Co. (Leeds) Ltd., Steam Plough Works, Leeds.

Engravers.

John Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

Exhaust Steam Oil Separators.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

Fans, Blowers.

Capel Fan Co., 13, Moseley Street, Newcastle-on-Tyne.

Davidson & Co., Ltd., "Sirocco" Engineering Works, Belfast

Ireland.

Gibbs, John & Son, 80, Juke Street, Liverpool.

Matthews & Yates, Ltd., Swinton, Manchester.

Files.

Fickler, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.

Fire Bricks.

J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town, London, E.

Firewood Machinery.

J. Glover & Co., Patentees and Saw Mill Engineers, Leeds.

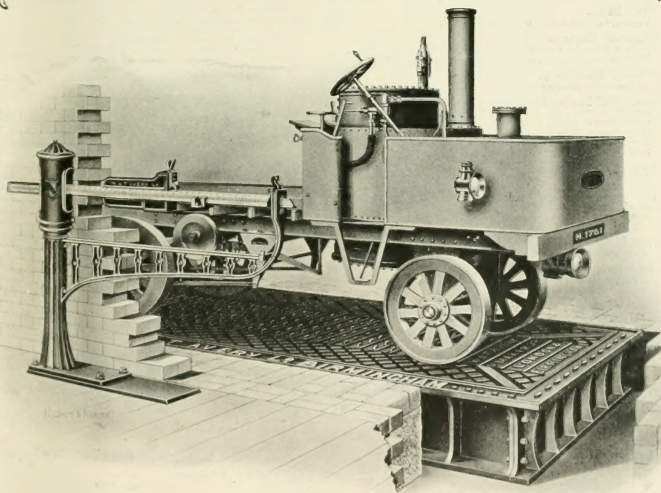
Hill and Herbert, Ltd., Great Central Street, Leicester.

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For Road or Railway Traffic.

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Fountain Pens.

Mable, Todd & Hard, 93, Cheapside, London, E.C.

Forging (Drop) Plants.

Brett's Patent Lifter Co., Ltd., Coventry.

Forgings (Drop).

J. H. Williams & Co., Brooklyn, New York, U.S.A.

Furnaces.

Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.

Gauge Glasses.

J. B. Treasure & Co., Vauxhall Road, Liverpool.
Tomney, J., & Sons, Aston, Birmingham.

Gauges (Pressure, Vacuum, and Hydraulic).

Lobbie, McInnes, Ltd., 45, Bothwell Street, Glasgow.

Gearing.

Ablers, Ad., Whitley Bay, near Newcastle-on-Tyne.
Angus, G. & Co., Ltd., Newcastle-on-Tyne.
Asquith, William, Ltd., Well Road Works, Halifax.
Dixon, W. F. & Co., 60, Percival Street, C. on-M. Manchester.
Diet Gear Co., Linwood, near Glasgow.
Wild, M. B. & Co., Argyle Street, Nethills, Birmingham.

Gold Dredging Plant.

Fraser & Chambers, Ltd., 3, London Wall Buildings, London, E.C.

Greases.

Blummann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Hack Saws.

Enynes, Charles, Knuzden Brook, Blackburn.

Hammers (Steam).

Davis & Pimrose, Leith Ironworks, Edinburgh.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Hoisting Machinery.

See Conveying Machinery.

Horizontal Boring Machines.

Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Hydraulic Leather.

Ablers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Hydraulic Leather Tools.

Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.

Icemaking and Refrigerating Machinery.

H. J. West & Co., 114-118, Southwark Bridge Road, London, S.E.

Indicators.

Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow.
Hannan & Buchanan, 75, Robertson Street, Glasgow.

Iron and Steel.

Allen, Edgar, & Co., Ltd., Imperial Steel Works, Sheffield.
Askham Bros. & Wilson, Ltd., Sheffield.
Buckley, Saml., St. Paul's Square, Birmingham.
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.
Farrington Iron Co., Ltd., Leeds, England.
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.
Fried, Krupp, Grusonwerk, Magdeburg-Buckau, Germany.
J. Frederick Melling, 14, Park Row, Leeds, England.
Parker Foundry Co., Derby.
Furden, John & Sons, Lambhill Forge, by Maryhill, Glasgow.
Walter Scott, Ltd., Leeds Steel Works, Leeds, England.

Ironwork (Constructional).

F. A. Keep, Juxon & Co., Earn Street, Birmingham.

Ironwork (Galvanised).

F. A. Keep, Juxon & Co., Earn Street, Birmingham.

Lagging Sheets.

Zeitz & Co., 21, Lime Street, London, E.C.

Lathes.

Asquith, William, Ltd., Well Road Works, Halifax.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Eclipse Tool Manufacturing Co., Linwood, near Glasgow.
Leckenby, Benton, & Co., Farnsworth Ironworks, Halifax.
Mitchell, D. & Co., Ltd., Farnsworth Works, Keighley.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.
Swift, George, Clarence Ironworks, Halifax.

Lathe Carriers

Williams, J. H. & Co., Brooklyn, New York, U.S.A.

Laundry Machinery.

Hill and Herbert, Ltd., Grant Central Street, Leicester.
Summerscales, W., & Sons, Ltd., Engineers, Phoenix Foundry, Keighley, England.

Lifts.

Waygood & Co., Ltd., Falmouth Road, London, S.E.

Lubricants.

Blummann & Stern, Ltd., Plough Bridge, Deptford, London, S.E.
Reliance Lubricating Oil Co., The, 19 & 20, Water Lane, Great Tower Street, London, E.C.

Machine Tools.

Asquith, William, Ltd., Well Road Works, Halifax.
George Addy & Co., Waverley Works, Sheffield.
Baleman's Machine Tool Co., Hunstet, Leeds.
Beanland, Perkin, & Co., School Close Works, Leeds.
Bertram, Ltd., St. Katherine's Works, Sciennes, Edinburgh.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Breuer, Schumacher & Co., Ltd., Kalk, near Cologne-on-Rhine (Germany).
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.
Cunliffe & Croom, Ltd., Broughton Ironworks, Manchester.
Dean, Smith & Grace, Ltd., Keighley.
Dempster, Moore & Co., Ltd., 49, Robertson Street, Glasgow.
Fengl, A. & Co., Gratton Street, Altrincham.
Greenwood & Batley, Ltd., Leeds.
Jones & Lamson Machine Co., 97, Queen Victoria Street, London, E.C.
John Lang & Sons, Johnstone, near Glasgow.
Luke & Spencer, Ltd., Broadheath, Manchester.
Jos. C. Nicholson Tool Co., City Rd. Tool Wks., Newcastle-on-Tyne.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.
J. Parkinson & Son, Canal Ironworks, Shipley, Yorkshire.
C. Redman & Sons, Halifax.
Resides, 12, Aire Street, Erighouse, Yorks.
Rice & Co. (Leeds), Ltd., Leeds, England.
G. F. Smith, Ltd., South Parade, Halifax.
Swift, George, Clarence Ironworks, Halifax.
Taylor and Challen, Ltd., Derwent Foundry, Constitution Hill, Birmingham.

Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.

H. W. Ward & Co., Lionel Street, Birmingham.

T. W. Ward, Albion Works, Sheffield.

West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.
Winn, Charles & Co., St. Thomas Works, Hirmingham.

Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Machinery Merchants.

Greenwood, Thomas, Waterside, Halifax.

Marks.

Fryor, Edward, & Son, 68, West Street, Sheffield.

Metals.

Delta Metal Co., Ltd., East Greenwich, London, S.E.
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.
Phosphor Bronze Co., Ltd., Southwark, London, S.E.

Metals (Perforated).

Brown, Andrew, & Co., 110, Cannon Street, London, E.C.
Meguin, Fr. & Co., Ltd., Engineering Works, Dillingen-on-Saar.

Mining Drill Steel.

Flockton, Tompkin, & Co., Ltd., Newhall Steel Works, Sheffield.

Office Appliances.

Doves J. hn. & Son, 141, 30, All Saints' W. rks, Derby.
Holden & Co., J., 8, Albert Square, Manchester.
Hall & Co., B. J., 39, Victoria Street, London, S.W.
Impregnat, T., & Sons, Ltd., Atlas House, Leicester.
Lyle Co., Ltd., Harrison Street, Gray's Inn Road, London, W.C.
Rockwell-Watson Co., Ltd., 49, Milton Street, London, E.C.
Shannon, Ltd., Ropemaker Street, London, E.C.
Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, London, E.C.

Oils, &c.

Blummann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Oil Filters and Cabinets.

Valor Co., Ltd., Rocky Lane, Aston Cross, Birmingham.

Packing.

Beldam Packing & Rubber Co., 93-94, Gracechurch Street, London, E.C.
Lancaster & Tonge, Ltd., Pendleton, Manchester.
Redden & Co., S. Swan Lane, New Brown Street, Manchester.
Quaker City Rubber Co., Coronation House, Lloyd's Avenue, E.C.
United States Metallic Packing Co., Ltd., Bradford.

Paper.

Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W.C.

Patent Agent.

Lorain J. G., M.I.E.E., M.I.Mech.E., Norfolk House, Norfolk Street Strand, London, W.C.

PAGE'S WEEKLY Pumping Machinery

Pumping Machinery

FOR WATERWORKS AND MINES.

Official

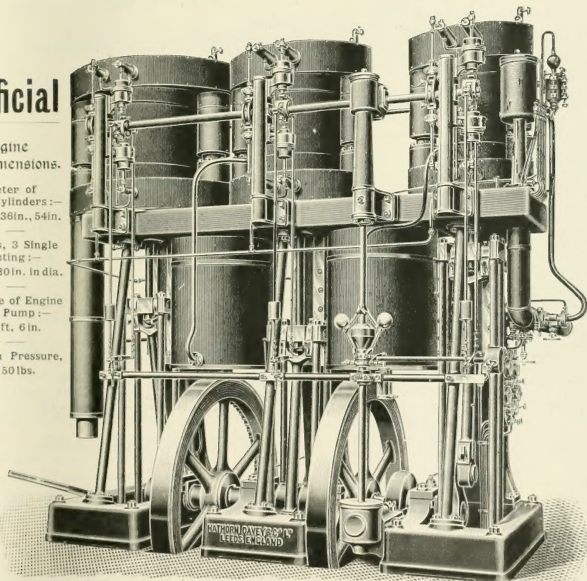
Engine Dimensions.

Diameter of Cylinders :—
20 in., 36 in., 54 in.

Rams, 3 Single
Acting :—
Each 30 in. in dia.

Stroke of Engine
and Pump :—
3 ft., 6 in.

Steam Pressure,
150 lbs.



Trial.

Engine Results.

Pump Horse
Power :—
274.5.

Saturated Steam
per Indicated
Horse Power
per hour :—
12.4 lbs.

Mechanical
Efficiency :—
92.8 per cent

Contract Duty to raise 6,240 Gallons of sewage per minute 125 feet high.

Triple Expansion Sewage Pumping Engine, Melbourne and Metropolitan Board of Works.

HATHORN, DAVEY & Co.,

LIMITED.

Codes Used :
A.B.C. 4th Edition.
Universal Mining Code.

LEEDS, England.

Telegrams :
HATHORN, LEEDS.

Buyers' Directory—(Continued).

Photo Copying Frames.

J. Halden & Co., 8, Albert Square, Manchester.
B. J. Hall & Co., 39, Victoria Street, London, S.W.

Photographic Apparatus.

Marion & Co., Ltd., 22 and 23, Soho Square London, W.

Pinch Bars.

Samson & Co., Garforth, near Leeds.

Pipe Wrenches (Chain).

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Pistons.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

Planished Sheets.

Zeitz & Co., 21, Lime Street, London, E.C.

Pneumatic Tools.

Consolidated Pneumatic Tool Co., Ltd., Palace Chambers,
9, Bridge Street, Westminster, S.W.

Porcelain.

Gustav Richter, Charlottenburg, near Berlin, Germany.

Presses (Hydraulic).

Greenwood & Batley, Albion Works, Leeds
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Publishers.

Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.
Spon, E. and F. N., 125, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.

Pulley Blocks.

Kramos Ltd., Lockbrook Engineering Works, Bath.

Pumps and Pumping Machinery.

Drum Engineering Co., 33, Brook Street, Bradford.
Enke, Carl, Schkeuditz-Leipzig, Germany.
F. R. & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
J. P. Hall & Sons, Ltd., Peterborough.
Hathorn, Davey & Co., Ltd., Leeds, England.
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London, W.C.

Radial Drilling Machines.

Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Mitchell, D., & Co. Ltd., Parsonage Works, Keighley.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.
Swift, George, Clarence Ironworks, Halifax.

Rails.

Wm. Firth, Ltd., Leeds.

Riveted Work.

F. A. Keep, Juxon & Co., Forward Works, Barn Street, Birmingham.

Roller Bearings.

Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

Roofs.

D. Anderson & Son, Ltd., Lagan Felt Works, Belfast.
Clayton, Son & Co., Ltd., Hunslet, Leeds.
Hend, Wrightson & Co., Ltd., Thornaby-on-Tees.
McTear & Co., Ltd., Newtownards Road, Belfast.

Ropeways (Aerial).

Buileant & Co., Ltd., 72, Mark Lane, London, E.C.
Fohlig, J., Ltd., Cologne, Germany.

Scientific Instruments.

Cambridge Scientific Instrument Co., Ltd., Cambridge

Slotting Machines.

Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax

Spanners.

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Stampings.

Thomas Smith & Sons of Saltley, Ltd., Birmingham
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Stamps (Rubber).

Rubber Stamp Co., 1 & 2, Holborn Buildings, Broad Street Corner, Birmingham.

Stamps (Metal).

Edward Pryor & Son, 68, West Street, Sheffield.

Steam Traps.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

Steam Wagons.

Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds

Steel Structures.

Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.
Clayton, Son & Co., Ltd., Hunslet, Leeds.

Steel Tools.

Sam'l Buckley, St. Paul's Square, Birmingham.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.

Steel (Tool Steel).

Flockton, Tomplin & Co., Ltd., Newhall Steel Works, Sheffield.

Stokers.

Ed. Bennis & Co., Ltd., Bolton, Lancs.

Stone Breakers.

S. Pegg & Son, Alexander Street, Leicester.

Superheaters.

A. Bolton & Co., 49, Deansgate, Manchester.

Testing Machines.

Denison, Sam'l, & Son, Ltd., Hunslet Moor, near Leeds.

Time Recorders.

Howard Bros., 40, Paradise Street, Liverpool, and 100b, Queen
Victoria Street, London, E.C.

Tubes.

Thomas Piggott & Co., Ltd., Spring Hill, Birmingham.
Tubes, Ltd., Birmingham.

Turbines.

Greenwood & Batley, Albion Works, Leeds.
S. Howes Co., 64, Mark Lane, London, E.C.

Typewriters.

Empire Typewriter Co., 77, Queen Victoria Street, London, E.C.
Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

Valves.

Holmes & Co., W. C., Huddersfield.
Hopkinson, J. & Co., Ltd., Britannia Works, Huddersfield.
Hunt & Milton, Crown Brass Works, Osells Street, North
Birmingham.
Scotch and Irish Oxygen Co., Ltd., Rosehill Works, Glasgow.
Shaw, Joseph, Albert Works, Huddersfield.
Wian, Charles, & Co., St. Thomas Works, Birmingham.

Ventilating Appliances.

Mathews & Yates, Ltd., Swinton, Manchester.

Water Softeners and Purifiers.

Lassen & Hjort, 52, Queen Victoria Street, London, E.C.

Wagons—Steam.

Thornycroft & Co., J. I., Ltd., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds

Weighing Apparatus.

W. & T. Avery, Ltd., Soho Foundry, Birmingham, England.
Denison, Sam'l, & Son, Ltd., Hunslet Moor, near Leeds.

Wells Light.

A. C. Wells & Co., 100a, Midland Road, St. Pancras, London, N.W.

Wire Ropes.

Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

Wire Working Machinery.

Ed. Brand 35, Shakespeare Street, Manchester.

"Woodite."

"Woodite" Company, Mitcham, Surrey.



CARR'S LATHE BORING TOOL.

ABSOLUTELY
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MADE OF
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Embodies FOUR SIZED CUTTING TOOLS in One Holder

Is suitable for either English or American Lathe Carriages. As the Cutters become worn, they may be easily sharpened. These Cutters are manufactured of Plain, Round Steel, but High-speed Steel can be used if desired.

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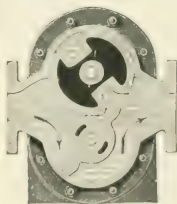
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POSITIVE ACTION
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Roller Bearings in position

Hyatt Roller Bearing Co.

The Hyatt Flexible Roller Bushing,

when applied to Self-Watering Cylinders, Trolleys, Foundry Wagons, and other similar applications, is found to be most efficient and durable, and is the only one that can be used in the most difficult cases.

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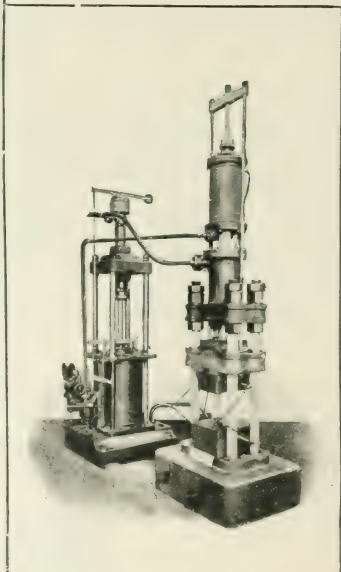


Hyatt Roller Bearing

PAGE'S WEEKLY

Machine Tools

The Kalk Machine Works
BREUER, SCHUMACHER
& Co., LTD.,



**KALK, near Cologne-on-
Rhine
(GERMANY).**

Department I.

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Department II.

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FOR STEEL WORKS, &c.**

Department III.

ROLLING MILL PLANTS.

Department IV.

HYDRAULIC MACHINERY.

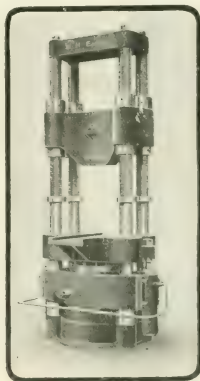


THE
Vauxhall & West Hydraulic Engineering Co.
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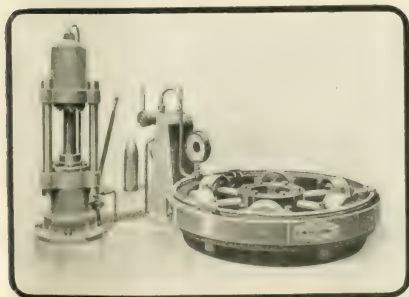
Contractors for Hydraulic
Plant and Testing Machines
to the Governments of

GREAT BRITAIN,
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FRANCE,
RUSSIA,
ITALY,
SPAIN,
BELGIUM,
SWITZERLAND,
HOLLAND,
JAPAN,
CHILI.

Crown Agents for the
Colonies,
S'c., S'c.



Shell Press

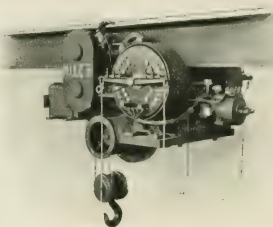


Patent Shell-Banding Press.

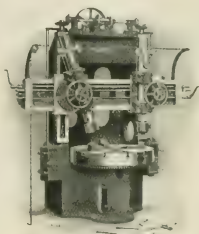
PAGE'S WEEKLY Machine Tools

MACHINE TOOLS.

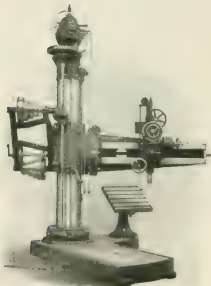
**ELECTRIC
TRAVELLING
CRANES and
HOISTS.**



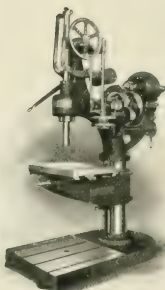
3 ton Electric Hoist.



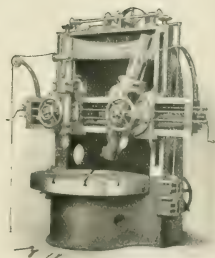
37 in. Boring Mill.



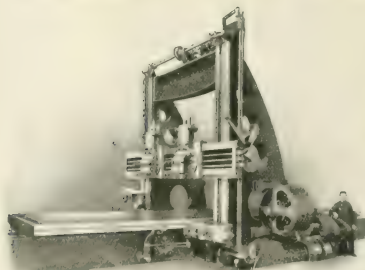
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50 in Vertical Drill.



51 in. Boring Mill.



10 ft. Planer. Pneumatic Clutches.

Complete Equipment for Locomotive,
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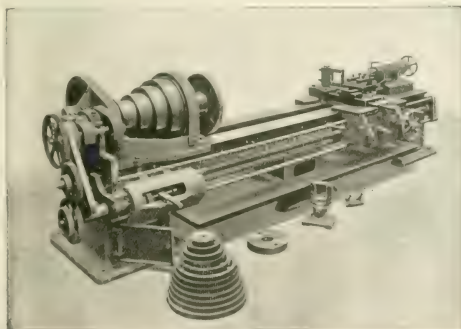
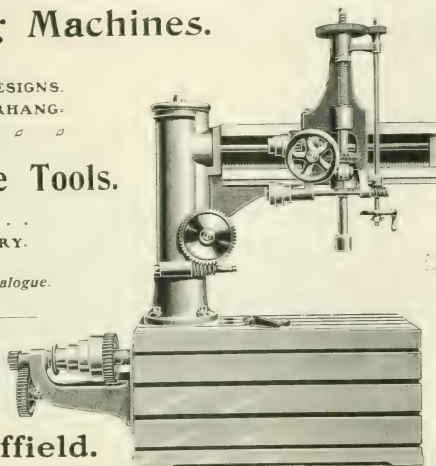
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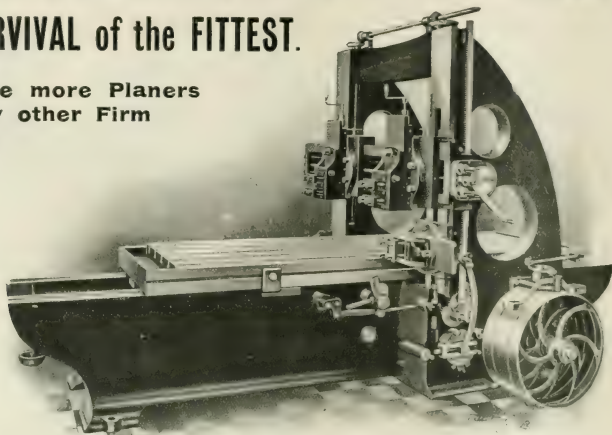
PAGE'S WEEKLY

Machine Tools

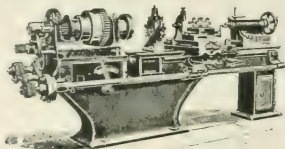
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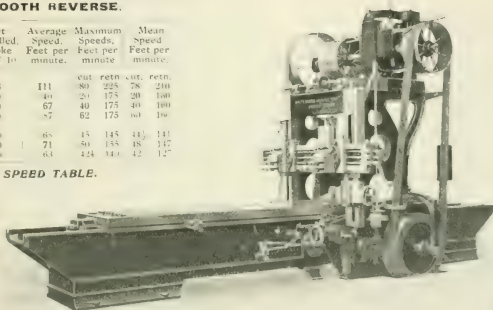
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1. VARIABLE SPEEDS ON THE CUT.
2. CONSTANT HIGH SPEED ON THE RETURN.
3. PROMPT BUT SMOOTH REVERSE.

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|----------------------------------|-------------------|------------------|---------------------------------|---------------------------------|---------------------------------|------------------------------|----|-----|
| in. ft. | ft. in. | sec. | | | cut. retrn. | cut. retrn. | | |
| 24 x 24 x 6 | 4 6 | 1 8 | 126 | 111 | 80 | 225 | 78 | 210 |
| 36 x 36 x 12 | 12 0 | 6 6 | 240 | 40 | 20 | 175 | 20 | 160 |
| With 3 speed gear box for 12 ft. | 12 0 | 2 46 | 240 | 67 | 40 | 175 | 40 | 160 |
| | | | | 57 | 62 | 175 | 60 | 150 |
| 42 x 42 x 20 | 22 6 | 6 39 | 450 | 65 | 15 | 145 | 41 | 141 |
| 42 x 42 x 34 | 14 0 | 3 56 | 280 | 71 | 50 | 135 | 48 | 147 |
| 60 x 60 x 12 | 11 0 | 4 8 | 260 | 63 | 424 | 340 | 42 | 127 |

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Time your planers and compare with the above speeds. Then calculate what you lose yearly by using old-fashioned tools, and write to us for our Catalogue.



36 in X 36 in X 12 ft patent HIGH SPEED PLANNER, with Three Speeds on the cut (20, 40, and 60 ft. per min.) and constant return speed (175 ft. per min.)

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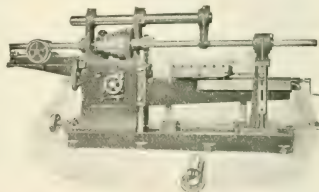
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Large range of speeds and feeds.
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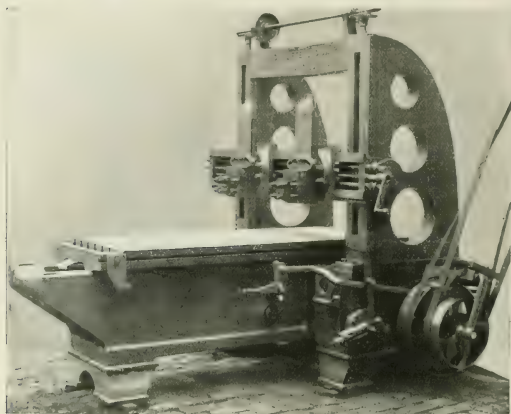
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Deep Bed, Strong Table
Unrestricted Belt Angle,
All Gears and Rack Cut
Absolutely No Shock
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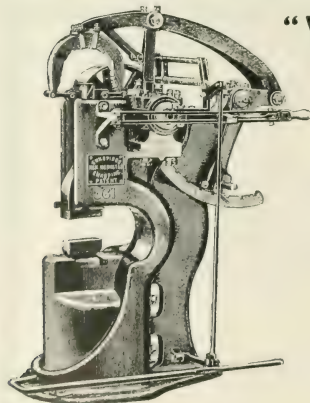
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Ball races to guide screws. Traverse can
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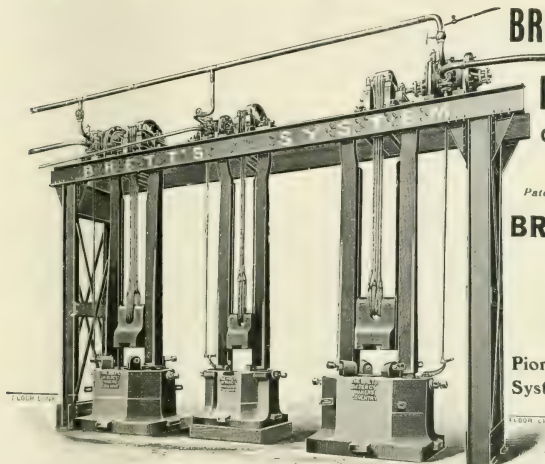
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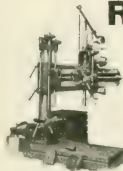
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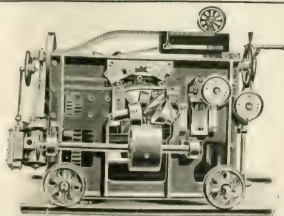


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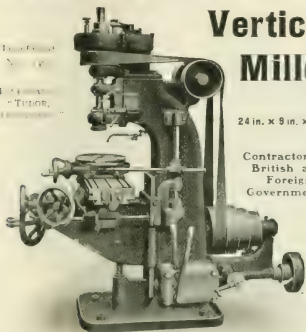
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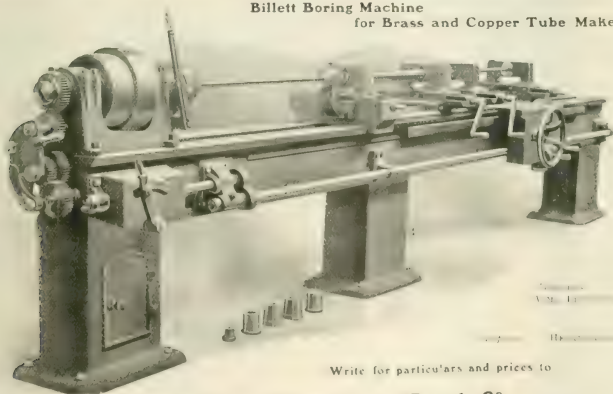
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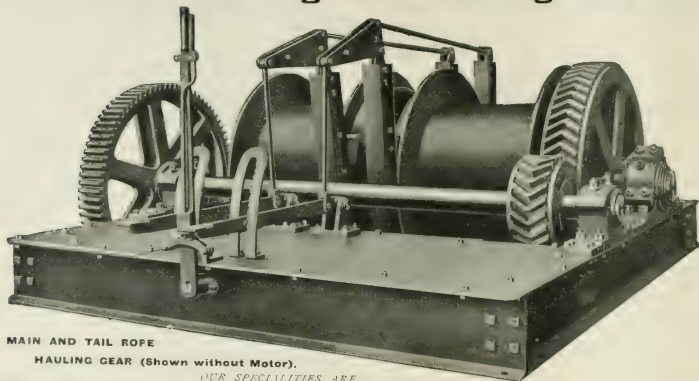
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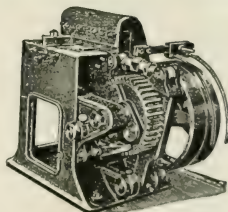
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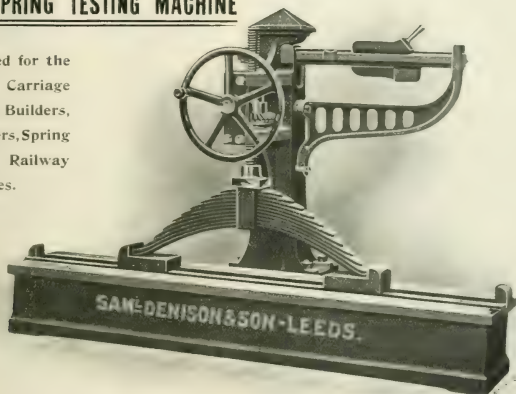
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**"WHITE ANT"
BRONZE.**

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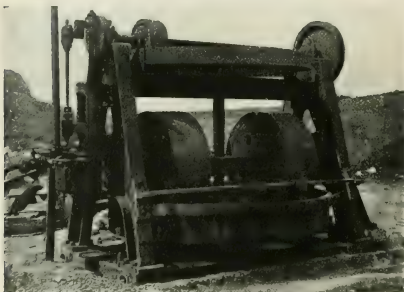
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for Phosphor Bronze
Alloys.

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Miscellaneous

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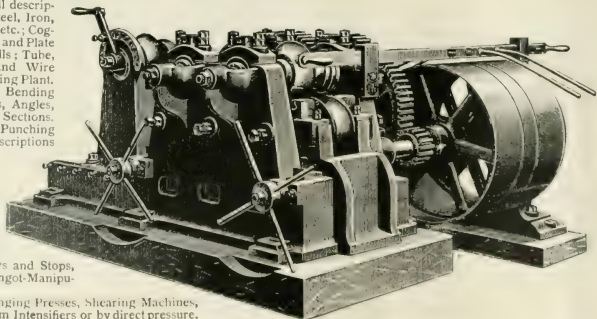
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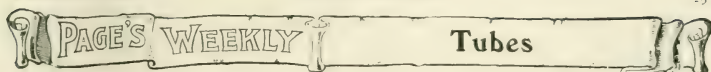
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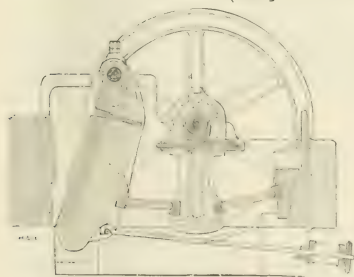
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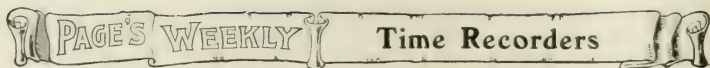
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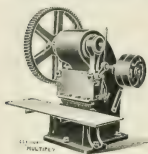
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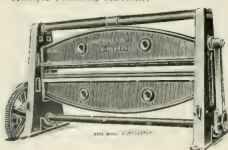
PAGE'S WEEKLY

Miscellaneous

MACHINE TOOLS



Multiple Punching Machine.



Improved Cold Chisel Machine.

Engineers,
Shipbuilders,
Boiler
Makers,
Etc., etc.

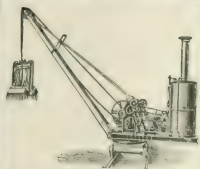
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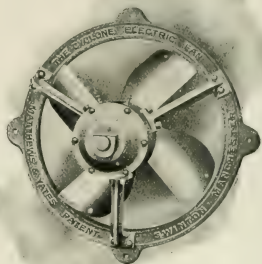
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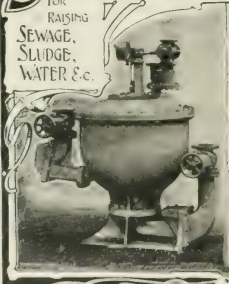
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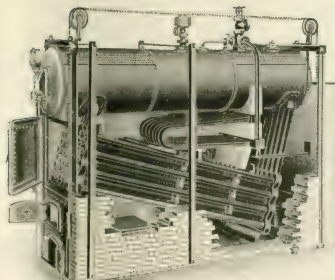
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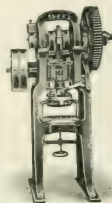
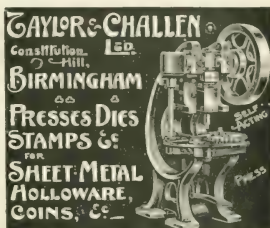
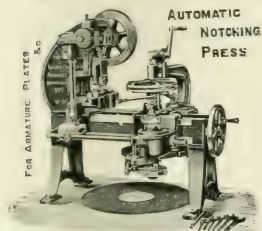
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|---------------------------|------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|---------------------------|
| | MON | TUE | WED | THU | FRI | SAT | SUN | MON | TUE | WED | THU | FRI | SAT | SUN | |
| METALLUR • • • Birmingham | | | | | | | 1 | 2 | | | | | | | No. 406 • • • Birmingham |
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| METALLUR • • • • • GILFON | 10 | 11 | 12 | 13 | 14 | 15 | 16 | | | | | | | | No. 1711 • • • LITTON |
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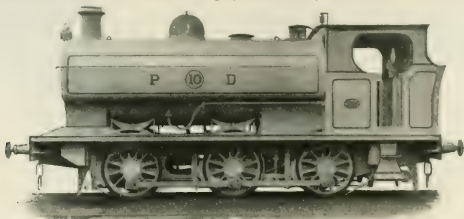
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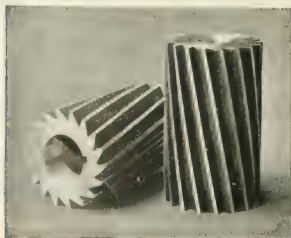
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PAGE'S WEEKLY

An Illustrated Weekly Journal devoted to the Engineering, Iron and Steel, Mining, Electrical, and Shipbuilding Industries.

DAVIDGE PAGE, F.C.S., F.G.S., M.I.M.E., Editor

VOL. VIII.

LONDON, FRIDAY, FEBRUARY 16, 1906.

No. 75.

THE OFFICES OF "PAGE'S WEEKLY,"

Wednesday evening.

THE concentration of the Channel, Atlantic, and Mediterranean fleets with the first, second, and third cruiser squadrons off the western coast of Portugal, will shortly be effected under Admiral Sir A. K. Wilson, for the purpose of joint tactical exercises. According to the Morning Post, the most striking feature in these three fleets and three squadrons is the great care which has been taken in their organisation. The arrangement of the Channel and the Atlantic in two homogeneous divisions, the complete homogeneity of the Mediterranean, and the exclusion from the Cruiser Squadrons of all vessels with less than 22 knots speed ensure that an officer who has the responsibility of directing such an immense force against an enemy will be able to derive the utmost advantage from the special qualities of each of its component parts. Its strength may be judged from the following summary of its gun-power :

| Guns. | Channel, Atlantic, Mediterranean. | | | | Cruiser Squadrons | | Total |
|---------------|-----------------------------------|-----|-----|-----|-------------------|-------|-------|
| | | | | | 12 and 10 in. | 8 in. | |
| 12 in. ... | 52 | 32 | 32 | ... | ... | ... | 116 |
| 10 in. ... | 4 | ... | ... | ... | ... | ... | 4 |
| 9 2 in. ... | ... | 20 | ... | ... | 2 | 2 | 26 |
| 7 1/2 in. ... | 14 | ... | ... | ... | 20 | 4 | 38 |
| 6 in. ... | 130 | 80 | 90 | ... | 40 | 80 | 514 |

The potentiality of a force thus armed can be realised by comparing these figures with the armament of the two contending fleets at the Battle of Tsushima. Reckoning 10 in. and upwards as heavy guns, and all weapons from

4 7 in. to 10 in. as medium, the following is the result :

| | Japanese Fleet. | British Fleet. | Total Armament. | Total Armament Adm. Wilson's Forces. |
|------------|-----------------|----------------|-----------------|--------------------------------------|
| Heavy ... | 17 | 41 | 58 | 120 |
| Medium ... | 11 | 50 | 100 | 578 |



BERNARD CLARK, M. Inst. C.E., F.C.

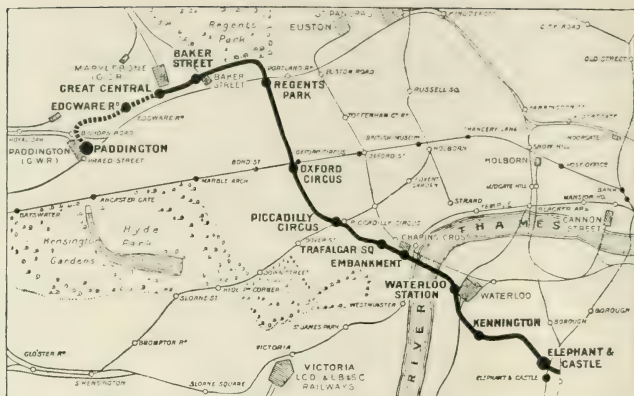
Who presided at the Annual Dinner of the Institution of Engineers on Saturday last.

seen that, besides connecting up some of our most important railway termini, it provides an outlet at its southern end for a great working-class population, to say nothing of the convenient means which it affords for getting about the West End. Mr. Stephen Sellon, M.Inst.C.E., who drew up a report on the line last year, estimated that with the average speed of 14 miles per hour, which the equipment is calculated to maintain, it will be possible to travel from the Elephant and Castle to Paddington in 22 minutes, from Waterloo to Paddington in 17 minutes, from Charing Cross to Paddington in 14 minutes, from Marylebone to Waterloo in 13 minutes, and from Marylebone to Charing Cross in 10 minutes. One has often enough had reason to grumble at the time wasted in getting to Paddington *à la* hansom, and not infrequently, owing to congestion of traffic, it is to be feared that passengers from Waterloo have arrived at the Great Western Railway terminus, only to see their train speeding out of the station. The new railway will change all that.

In general arrangement the two circular tubes follows the plan to which we have now become accustomed, consisting of cast-iron segments bolted together, and running on a gradually ascending gradient, but with numerous curves, until Paddington is reached. Except beneath the Thames, where special difficulties were encountered, they have been carried almost entirely through London clay, the internal diameter being 11 ft. 8½ in. on straight tracks, and in curves of not less than 20 chains radius, 12 ft.; on curves of not less than 10 chains radius, a diameter of 12 ft. 6 in. has been allowed. The station tunnels are 21 ft. 2½ in. in diameter. Under the Thames a special form of shield had to be used, with compressed air in order to cope with a sub-strata of loose water-bearing gravel. The multiple-unit system of control has been adopted for working

the line, power being received from Chelsea through the medium of three sub-stations. The motor trucks are identical with those fitted to the motor cars of the District Railway, the electrical equipment of the trains generally being very similar to that of the older line. The conductor rails, supplied by the Aachener Hütten Actien Verein, are practically a solid square in section, the object being to save space vertically, and at the same time to get a high electrical conducting power.

By using steel for their cars, Karri wood for their sleepers, and fireproof materials for the other details of their line, the Underground Electric Railways Company have done much to add to the assurance of safety in the new tube. The station platforms are of concrete with stoneware edging similar to the new District Railway platforms. A railway dépôt has been completely equipped at St. George's Circus. The rolling stock is being supervised by Mr. F. D. Ward, master mechanic to the Underground Electric Railways Company, and is being carried out at the Trafford Park Works of the American Car and Foundry Company. The supervision of the permanent way on their behalf has been carried out by Mr. W. E. Hanson, the contract for the construction of the tunnels and the laying of the permanent way of the original portion of the railway from Baker Street to Waterloo was carried out by Messrs. Perry and Co., Tredegar Works. Bow, who also had the contract for the extension from Baker Street to Edgware Road. The extension from Waterloo to the Elephant and Castle, and the formation of the dépôt at St. George's Circus, has been undertaken by Messrs. John Mowlem and Co., Millbank. The engineer-in-chief and general manager of the Underground Electric Railways Company of London, Mr. James R. Chapman, is responsible for the general organisation.



BAKER STREET AND WATERLOO RAILWAY.



By permission of the Railway News.

TRAIN IN CROSS-TUNNELL NEAR KENNINGTON ROAD STATION.—BAKER STREET AND WATERLOO RAILWAY.

It is interesting to note that every train-driver's "cab" has a telephone outfit whereby the driver can speak from the tunnels to any station and to any of the numbers of the National or Post Office exchanges; each driver's controller automatically cuts off the current and applies the brakes if the handle is released for an instant. Each signal is provided with a train stop which automatically applies the brakes to prevent a train from running past a danger signal. Special lights at intervals of 40 ft. are provided throughout the tunnels. The space between the running rails being filled in with cement and granite chippings, there is an accessible and well-lighted footpath the whole length of the line. The station platforms are constructed entirely of concrete and iron. On Tuesday a number of members of the Tramways and Light Railways Association and some press representatives made a tour of inspection of the new line, the programme including a very successful trial trip, an inspection of the subway connecting with the Metropolitan District Railway at the Embankment Station, the emergency telephone apparatus, and (at Kennington) an inspection of the track circuit, illuminated diagram, manganese steel crossing, permanent way, etc. The visit closed with a journey by train to the dépôt and the inspection of the apparatus there. The new tube will give facilities for interchanging traffic with the whole of the South London railways.

The diagram on page 389, drawn up by Mr. G. W. Colles, illustrates the world's production and consumption of sheet mica and incidentally the rapid development of the electrical industry. It is somewhat surprising to find that the United States uses from 55 to 60 per cent. of the total quantity of mica produced, but Mr. Colles tells us that this ratio has been practically maintained for the past fifteen years. As regards production it is remarked

that figures are stated for the United States as far back as 1880, while those for Canada run back to 1886, and those for India back to 1889. Canada produced little or no mica before 1885, but India has produced and exported mica to Europe, certainly for more than a century, and has exported to the United States since 1883. During the years 1893 to 1896 the industry of mica mining was all but extinguished in the United States, and had dwindled to insignificant proportions compared with those of Canada and India. Since 1896, however, the industry shows sure signs of a permanent revival, for while the total value of the product has fully held its own, in the face of falling prices, the volume has continuously increased. Mr. Colles refers to the Canadian line as one especially indicative of a young industry and one having a great future before it.

Mr. Wager Bradford's paper on the mono-rail in mines, and that by Mr. D. T. Williams, dealt with in the present issue, call attention to the considerable saving which can be effected in handling ore in the stopes. The interest taken in the matter by the members of the Transvaal Institute of Mechanical engineers has been very marked and the discussion which followed Mr. Williams' paper showed that a final solution of the problem has been by no means attained. The figures supplied by Mr. Williams indicated that the saving that must be effected on a 100-stamp mill amounts to £400 a month. Of course the list did not give full particulars of every kind of stope conveyor, but all the appliances described appear to be capable of very successful work when carefully selected with regard to existing conditions and carried out under proper supervision. Nevertheless the President of the Institute says there is still plenty of room for good stope conveyors, and he thinks the man on the spot might find a good opening for his ingenuity in this direction.

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Personal Pars.

Sir Andrew Noble, we are informed, continues to make progress towards recovery.

The French Academy of Sciences, on January 12th, elected Sir William Crookes as corresponding member for its Physical Section, to succeed the late M. Bichat.

Sir James Kitson, M.P., who distributed the prizes to the Saddleworth Volunteer detachment on Saturday, said that, as a large employer of labour, he knew the value of such training as the volunteers received. The man who made himself efficient in drill and discipline was best calculated to make the best artisan.

Lord Justice Fletcher Moulton was entertained at dinner on the 7th inst. by the London Chamber of Commerce, to commemorate the passing of the Trade Marks Act. He said he believed the Act would be satisfactory, and the prime cause of its passing was that it came from the mercantile community, and was not imposed upon them.

In the presence of a large number of specially invited supporters of higher education, the Lady Mayoress of Sheffield, on Monday afternoon, unveiled, at the Sheffield University, a portrait of Dr. Henry Clifton Sorby, F.R.S. It had been subscribed for by friends in recognition of Dr. Sorby's life-long devotion to science, and his services in the spread of it. Dr. Sorby is in his 80th year, and it was not thought advisable that he should be present.

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In our abstract of the presidential address delivered at the last meeting of the Society of Engineers, we inadvertently omitted to mention the name of the new President, Mr. Maurice Wilson, A.M.Inst.C.E. A sketch of Mr. Wilson's career will be found in our issue of the 26th ult.

Mr. Richard Lees has been appointed chief superintendent of telegraphs at the Manchester General Post Office, in the room of Mr. W. E. Halton, who retired lately on pension.

The Right Hon. John Lloyd Wharton has been elected chairman of the directors, and Mr. Henry Tennant and the Right Hon. Lord Knaresborough were elected deputy chairmen. Sir George Gibb, although retiring from the general manager-ship, will remain a director of the company.

Mr. William Smith, the locomotive accountant and stores superintendent of the Central Division of the North-Eastern Railway at Darlington, retires at the end of the present month, after having just completed sixty years' active railway service, during the past fifty-two of which he has held an executive position, which constitutes a record in the annals of railway service.

His Majesty the King, after launching the *Dreadnought* on Saturday, held an investiture, conferring the Knight Commandership of the Royal Victorian Order on Rear-Admiral H. D. Barry, the Superintendent of Portsmouth Dockyard, and Rear-Admiral Percy Scott, and that of Commander of the same Order upon Captain Jellicoe, Director of Naval Ordnance. It is understood that the two latter honours were given in connection with the great improvement that has recently taken place in naval gunnery.

Dartmouth Tramways.

The system was formally declared opened for traffic on Wednesday by Mr. J. Lawrence Mitchell, the chairman of the District Council. The lines run through the centre of Dartford, and connect up with the existing London tramways system, and also make a junction with the Erith tramways. There is thus a completed route via the London County Council system to Dartford, and it is hoped at a future date to construct an additional mile and a half of line and connect with the Gravesend tramways. The line is constructed on the overhead trolley principle and the materials throughout are of British manufacture. The route mileage in operation is 6 miles, 3 furlongs, mostly single track with turnouts, the total double track being just over 8 miles. The line carries

cost is £93,000. The building of the line, save for one or two short steep gradients, the steepest being 1 in 12½ presented no engineering difficulties. The main contractors were Messrs. J. G. White & Co., who are the lessees.

Yarrow and Co.'s Removal.

WORKS at Millwall Dock were working overtime on Saturday night in the boiler shops, testing and experimenting on portions of the machinery to be fitted in two Greek vessels that are being built. This renewed activity in the yards at Millwall has led to a rumour that the firm have relinquished all idea of removing their establishment to a site in the North of England or the Clyde, where labour and materials and rates are not so exceedingly high. Nothing, however, favours this rumour. Local inquiries show that the present prosperity of the neighbourhood has not been equalled for some seven years past. The workmen employed by the firm are sanguine that so long as large contracts come along there is no actual fear of the dismantling of the works, being undertaken. It is estimated that the removal alone to a site on a northern waterway would cost the firm £200,000.

Junior Institution of Engineers' Dinner.

THE annual dinner of the Junior Institution of Engineers was held at the Hotel Cecil on Saturday last, the president, Mr. Dugald Clerk, M.Inst.C.E., in the chair. Among those present were Professor C. V. Boys, F.R.S., Professor J. D. Cornack, A.M.Inst.C.E., M.I.Mech.E., Mr. G. Croydon-Marks, M.P., Professor T. E. Thorpe, C.B.D.Sc., Professor E. J. Mills, D.Sc., F.R.S., Mr. F. S. Pilling, M.I.Mech.E., Mr. G. T. Bullock and Mr. L. H. Ruge, A.M.Inst.C.E. Professor C. V. Boys proposed "The New Parliament," and Mr. G. Croydon-Marks acknowledged. The president proposed "Chemical Science," to which Professor T. E. Thorpe responded. Other toasts were "The Junior Institution of Engineers," and "The President—coupled with the Internal Combustion Engine." During the evening testimonials from the Engineers' Club were presented to Mr. F. S. Pilling and Mr. G. T. Bullock in appreciation of their services to the Institution. Mr. Dugald Clerk, president, and Mr. Walter Dunn, who was received with enthusiasm, and accorded musical honours.

H.M.S. "Dreadnought."

H.M.S. *Dreadnought*, launched on Saturday by H.M. the King, is from more than one point of view, a remarkable *tour de force* in naval construction. In many respects the new vessel is unique; she may indeed be said to mark the arrival of a new epoch in naval matters. The forward policy of the Admiralty, which has been such a marked feature of Whitehall under the aegis of Sir John Fisher, has given Sir Philip Watts, K.C.B., Director of Naval Construction, a chance of carrying out his ideal, fast, and heavily armed ship, with an entire freedom from traditional trammels and conservative ideas. As a result, we have in the *Dreadnought* a vessel which is recognised by naval authorities as the longest, fastest, heaviest, most destructive, and best designed fighting unit in the world. In length she is nearly 500 ft., with a beam of 82 ft., and her displacement will be about 18,350 tons. Her draught will be about 28 ft. Thanks to her turbine engines, it is anticipated that she will realise a speed of 21 knots. Her tremendous battery of ten 12-in. guns will render her equal to a formidable combination, each gun being something like 25 per cent. more powerful than any which have been yet fitted in the Navy, and her armament giving a collective muzzle nearly of 480,000 ft. tons, as compared with the 270,000 ft. tons of the *King Edward VII.* class. The most significant feature is the mounting of a single type of big gun firing an 850 lb. projectile, but the novelty and originality of the *Dreadnought* by no means ends here. She has in addition a battery of guns of a new pattern firing 18 lb. shot for defence against torpedo attack.

The introduction of turbines, and a consequent lowering of the centre of gravity in the ship has conduced to the adoption of an ingenious arrangement of armament, the most important feature of which is that all the guns are placed upon a much higher plane. Not only will the *Dreadnought* be able to fire a terrible broadside of eight 12-in. guns, but by the position of her guns she will have a greatly enhanced chance of making every shot tell. The maximum fighting range of the 12-in. guns is given at 10,000 yards. Whether engaged in a running fight or in a broadside action she will be enormously superior to any other ship afloat. Two guns are mounted in barbettes on the forecastle level. To the rear of these there is on each side of the ship forward a pair of 12-in. guns, so that in chasing an enemy six 12-in. guns can be fired ahead. The other four of the ten guns of 12-in. calibre are at the

stern of the vessel, and are mounted in pairs in barbettes on the centre line of the ship and on the upper deck level, so that all four may fire from each broadside. Only the two after guns can be used for astern fire, but as there is little probability of the *Dreadnought* being pursued, this is a matter of no great significance.

The armour protection of the *Dreadnought* is arranged on a different principle from that in preceding ships. Each of the pairs of guns have their own armoured casing, and there was therefore no need to fit a central citadel or battery, so that the broadside armour, it may be presumed, is only for the protection of the machinery and magazines and to insure flotation of the vessel. The belt is of very great depth and the great majority of the armour used is of 12-in. and 10-in. thickness. All the armour-plate manufacturers have assisted in supplying this armour, so that the work might be expeditiously completed. The guns, as in the case of all barrette guns in previous ships, will have heavy shields or hoods, and the upper deck is heavily armoured for the protection of the gun positions, etc. All the guns are worked from above this level. Elaborate precautions have been taken to protect the hull against submarine attack; she is said to be practically unsinkable. No openings in the bulkheads have been permitted, the *Dreadnought* being built up in self-contained sections.

Steam in the new vessel will be supplied by eighteen Babcock and Wilson boilers, working at a pressure of 250 lb. and developing 23,000 i.h.p. Two high-pressure turbines and two low-pressure turbines will be fitted on separate shafts, and each shaft will also carry an astern turbine. Her manœuvring powers have been further increased by the provision of a double stern with two rudders. The rearrangement of quarters for officers and men and the location of the former in the forecastle is significant of a determination to be hampered by no conservative ideas in designing our future warships. The cost of the *Dreadnought* is set down at £1,700,000. The keel of the *Dreadnought* was only laid down in October last. In the early months of 1907 she is expected to be in a condition to undertake her trials. In view of the comparatively short life of modern warships, it seems certainly a move in the right direction to make the period of construction as short as possible, and it is understood that the arrangements now perfected at Portsmouth and Devonport for the rapid construction of warships will be permanent,

Technical Institution News.

Manchester Association of Engineers Jubilee.

More than local interest attaches to the dinner held at Manchester, on February 10th, to celebrate the jubilee of the Manchester Association of Engineers. One or two of the leading London organisations are of course of greater age, the Institution of Civil Engineers, which ranks first in every respect, having been founded in 1818, while the Institution of Mechanical Engineers was originally formed in Birmingham in 1847, and became a London institution in 1877. The next organisation in point of age is the North of England Institute of Mining and Mechanical Engineers, which originated in 1852. The Manchester Institution came next in 1852, followed by the Institution of Shipbuilders and Engineers in Scotland, which dates from 1857. The president of the jubilee year is Mr. Robert Matthews, one of the chiefs at Whitworth's works, and well-known in the Clyde district. He was supported at the jubilee dinner by representatives of nearly all the technical institutions of the kingdom.

Sir William White on Modern Warships.

In his third Cantor Lecture on Modern Warships at the Society of Arts, on Monday, Sir William White dealt chiefly with the guns and the means of attack. He explained how high muzzle velocity and penetrative power had been attained by constant improvements in the guns, and by the use of higher projectiles, the result being to give flat trajectories and greater accuracy in shooting, as well as the power of effective use at long range. Sir William then traced the changes that had taken place in the disposition of the armaments from the days of the *Minotaur* down to the later *Nelson*. He also pointed out that the practical abolition of the secondary armament was no new idea, and had been the subject of discussion for years. It was really a tendency to return to a state of things in the old *Dreadnought*. It was argued that, with the very long ranges at which fighting now took place, no gun but the 12-in. was an effective weapon. Judging from public descriptions of the *Dreadnought*, she had two 12-in. guns in the fore-castle, with two pairs of the same guns behind; in that case, in the conditions that would give six guns ahead, continuous fighting would

be impossible for four of them. Again, the ammunition for these six guns must be massed in a comparatively small longitudinal area. He did not wish to raise objections to the *Dreadnought*, but from what had been published about her it appeared that the desire to increase bow fire and broadside fire in her involved serious drawbacks and left untouched the objections to the omission of a secondary armament.

Institution of Mechanical Engineers, Annual Report.

The annual report of the Institution of Mechanical Engineers to be presented at the meeting to-night, shows that the total number of members on the roll of the institution at the close of last year was 4,750. The institution has lost by death during the year thirty-nine members, including a past president in the person of Sir Edward Carbutt, and Sir Bernhard Samuelson, Mr. James Mansergh, Mr. Morcom, Mr. William Sellers, and Mr. G. R. Stephenson. The total revenue for the year was £12,713 10s. 9d., and there was a balance over expenditure of £1,620. The total investments and other assets amount to £74,774.

Work of Gas-Engine Research Committee.

The Gas-Engine Research in connection with the two specially constructed large gas-engines at the University of Birmingham is being carried on by Professor F. W. Burstell. The effect of changing the compression, other things being constant, is now being investigated. Special arrangements have been found necessary for dealing with the high compression, and the presentation of the next report is therefore not expected during 1906. It is also intended to investigate the law governing the change of gas temperatures at various points within the cylinder. Sir Alexander B. W. Kennedy is the chairman of this committee.

Steam Engine Research Committee.

Reference is made to Professor Capper's report of the Steam Engine Research Committee. It is stated that the consideration of any further research of this committee has been postponed pending the

completion of a report to the institution from the Steam Jacket Research Committee under the chairmanship of Mr. Henry Davey, by Professor T. Hudson Beare, of his experiments already carried out at University College, London, and at Edinburgh, and of some further experiments which he is intending to make at the new engineering school of the Edinburgh University. Professor Beare's experiments were suspended during the greater part of the year, owing to pressure of work connected with building the new laboratories. These have now been completed, and Professor Beare hopes he will be able to present a report during 1906.

Programme of Alloys Research Committee.

The Alloys Research Committee, consisting of fifteen members under the chairmanship of Sir William H. White, has met twice during the year. The research on the properties of a Series of Iron-Nickel-Manganese-Carbon Alloys at the National Physical Laboratory was completed early in the year, and the seventh report of the committee, embodying the results of this research was presented and discussed at the November and December meetings of the institution. The discussion has been enriched by several written communications from foreign specialists. A research on the alloys of copper and aluminium has now been begun; and in connection therewith Mr. J. D. Bonner, Dr. R. T. Glazebrook, F.R.S., and Mr. Leonard Sumner have been appointed to the committee.

Institution of Civil Engineers.

At the ordinary meeting, on February 6th, Sir Alexander R. Binnie, president, in the chair, it was announced that fifteen associate members had been transferred to the class of members, namely: Messrs. R. Adam, J. W. Anderson, J. Cowan, M. Eliot, D. N. Goodall, J. Halliday, W. A. Harper, G. W. Herdman, E. P. Hooley, A. J. Knowles, A. de Linde, F. H. Livens, G. T. Lynam, P. le J. de Segrais, G. Watson. The monthly ballot resulted in the election of thirteen members—R. A. Dawbarn (Sidcup, Kent); R. M. Deeley (Derby); H. E. Gwyther (Rio de Janeiro); J. L. Harrington, B.Sc., B.A. (Kansas) (West New Brighton, New York); H. C. Kidd (London); W. W. Lackie (Glasgow); J. B. Lewis, M.C.E. (Melbourne) (Lottah, Tasmania); M. Maclean, M.A., D.Sc., (Glas.) (Glasgow); C. T. Purdy (New York); F. P. Purvis (Tokio); Frank Rigby (Alsager, Cheshire); M. D. Robinson (Indwe, Cape Colony); A. M. Sillar (London).

Report of the University of Leeds.

The second report of the University of Leeds for 1905, which has just been issued, calls attention to the necessity for the immediate provision of further accommodation, more particularly in the faculties of science and technology. The Department of Civil and Mechanical Engineering is very much overcrowded at times, especially in the drawing office; and, owing to the steady increase in the number of students of electrical engineering the work in that department also is seriously handicapped by want of room. The demands of the Department of Mining have been met for the time by the useful accommodation it has found at Woodhouse Lodge, recently acquired by the University. The fittings have, however, been necessarily of a merely provisional character, and it is hoped that before another year has elapsed the block of buildings for which special funds have been provided will have made considerable advance, if it has not been completed. The attention of the Senate during the past session has been chiefly given to the drafting of ordinances for the council and court, remodelling the courses of study which were prescribed for degree students in the Victoria University.

The Engineering Students.

The new arrangements made for general engineering students have proved very successful. The attendance at the class has more than doubled. The institution of an entrance examination for the evening laboratory classes has materially reduced the number attending, but the quality of the work done has distinctly improved. In the Department of Mining a third year course has been established for those students who are engaged at the pits and can only spend one afternoon a week at the University. This includes special instruction in electricity as applied to mining. Among the degrees instituted in the University is that of Bachelor of Commerce. In laying down a course of study for this degree, the Senate have endeavoured they believe successfully, to satisfy the claims of a liberal education, while providing a course of training preparatory for business life.

Submarine Telegraphy.

At the Royal Military School, Chatham, under the auspices of the Royal Engineers, Mr. Charles Bright, F.R.S.E., M.I.E.E., on the 9th inst., gave a lecture on "Submarine Telegraphy."

In the course of his remarks, which were fully

illustrated by lantern slides, Mr. Bright described the methods of transmitting electrical signals through cables, and mentioned that nowadays the speed of working was only limited by the type of cable in accordance with traffic requirements, thus shewing that wireless telegraphy for commercial purposes had a considerable task ahead, before it could compete successfully with cables.

Cable Construction and Laying.

He then went on to describe the various stages of construction in a cable from the copper conductor and insulator to the iron sheathing, tracing the great improvements that had been effected in the quality of materials, etc., since the first lines were laid, though the general principles of construction were practically the same.

The methods of surveying the ocean, of laying, picking up and repairing the cable, and providing for irregularities of the bottom, including the landing of the shore ends were next dealt with. Faults in a cable may be due to the tearing of an anchor, decay by vegetation, or caused by friction with a rock or reef, by the attacks of the teredo, saw-fish, sword-fish, shark, or whale. The Telegraph Fleet of some fifty vessels was then alluded to, as well as the cable testing hut, and signalling stations and instruments throughout the world. A résumé of submarine cable work from the very commencement followed, with portraits of the pioneers.

Statistics of Cost.

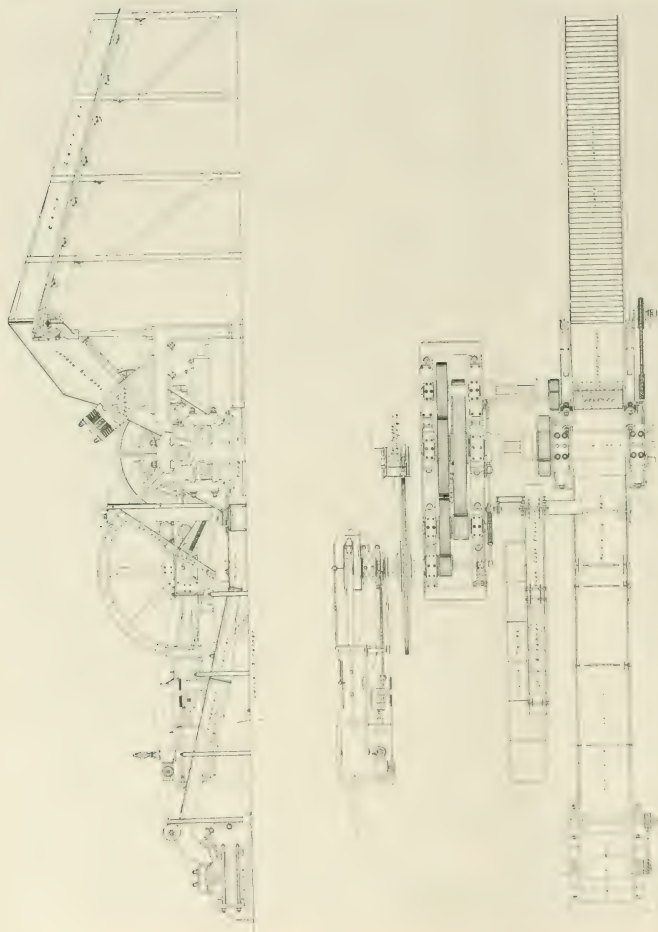
It appears that there are some 225,000 miles of cable in all at the bottom of the sea, representing £50,000,000 sterling, each line averaging about £200 per mile to make and lay. The average useful life of a cable nowadays may be anything between thirty and forty years, according to circumstances. About 6,000,000 messages are conveyed by the world's cables throughout the year, or 15,000 a day, the working speed for any one cable being up to 100 words per minute under present conditions. About 90 per cent. of these are sent in code or cypher for business and official purposes. The social, political and strategic importance of cables was then discussed, as well as the tariffs, which in the case of the Atlantic lines (of which there are fifteen) have been reduced from an initial £1 a word to the present rate of 10 shillings a word. The tariffs on all some tariffs ranging over 7s. a word.

Engineering Developments.

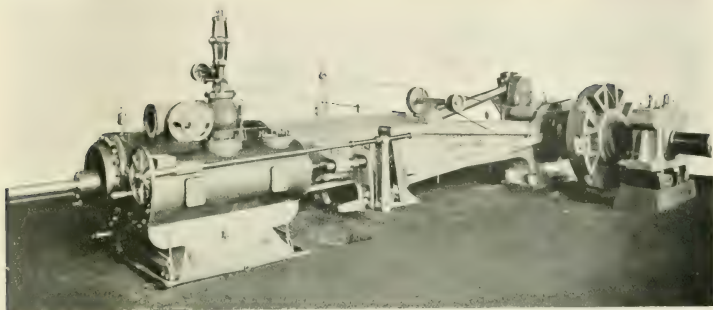
At the last meeting of the Sheffield Society of Engineers and Metallurgists, interesting addresses were delivered by both the retiring and incoming presidents—Mr. N. H. Ellis, on leaving the chair, reviewed engineering developments during his two years of office, calling attention to the progress of the turbine for marine propulsion, and the growth in the use of electricity for motive power. Referring to high-speed cutting, he said the great developments of recent years had greatly affected tool makers and the users of tools. Electric driving, he pointed out, had given reliable data as to the h.p. required for any one machine or cutting tool. When electric driving was first introduced, 25 h.p. for a single lathe was regarded as ample; to-day heavy lathes, with only this power, would not remove the amount of material which a high-class tool steel was capable of removing. Consequently new lathes, with 60 to 70-h.p. motors attached, were being ordered, and quite recently he had heard of a case of a 90-h.p. motor being applied to a single lathe. He suggested the grouping of three or more machines with an 80 or 100-h.p. motor as an advisable arrangement for all but special work.

Carbon Steel Problems.

Mr. W. F. Beardmore, the new president, referring to steel problems, said he would like to see more accurate data for the proper hardening and tempering of carbon steel, particularly in Sheffield, where superiority in such treatment was one of the principal causes of the high reputation attained by Sheffield tools. He would call it a subject of inexhaustible variety because he found that results varied not only in accordance with a difference with carbon or other alloy in the material, but also with differences of sizes and shape, and even differences of working the steel by hammering, rolling, and cold drawing. His company had made a large number of experiments to ascertain the actual result of heating to fixed temperatures and quenching in oil or water, and retempering at other fixed temperatures, test pieces being afterwards prepared and reported on by the Sheffield Testing Works. The temperatures were determined by the Siemens' pyrometer, an instrument he described in detail. They were thus able to standardise the effect of hardening, and his opinion was that if results of this character were exchanged between members of the society it would lead to considerable advance in a branch which had too long depended on the rule of thumb or rule of eye.



ELEVATION AND PLAN OF SUGAR-CANE CRUSHING MILL.



HORIZONTAL ENGINE FOR DRIVING CANE CRUSHING PLANT.

Cane Crushing Plant for British Guiana.

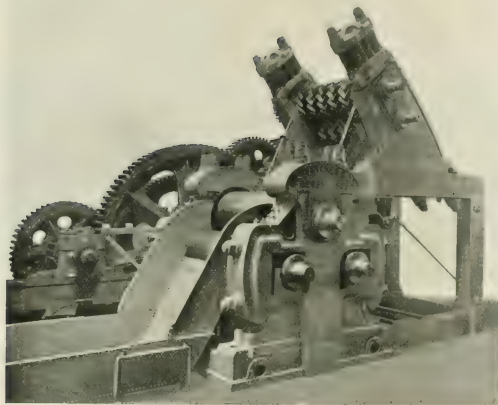
THE exceptionally powerful milling plant herewith illustrated has been constructed by Messrs. George Fletcher and Co., of Masson Works, Derby, for erection on plantation "Port Mourant," Berbice, British Guiana, to the order of Messrs. Booker, Bros., McConnell and Co., Ltd., of London, Liverpool, and Demerara, and in accordance with instructions received from Mr. W. H. Parratt, M.Inst.C.E., and Mr. C. T. Berthon, A.M.Inst.C.E., who act as consulting engineers to Messrs. Booker, Bros., McConnell and Co., Ltd., in Demerara and London respectively.

The plant comprises a five-roller crushing mill with steel gearing and driving engine. For the present campaign this five-roller mill will be worked in conjunction with an existing three-roller mill made a few years ago by Messrs. George Fletcher and Co. This old mill will shortly be discarded and replaced by a new three-roller machine of similar construction to the one now on the way to the colony, and eventually a third mill of similar pattern will probably

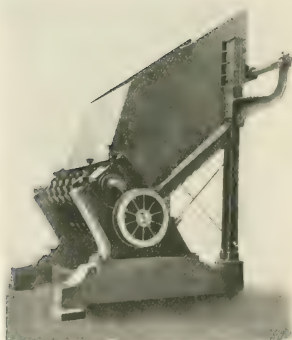
be added, forming altogether an 11-roller mill, which will be driven by one engine. The five-roller mill consists of two crushing and three grinding rollers 34 in. diameter by 72 in. long. The crushing rollers are of solid steel with helical corrugations, their duty being to break up the canes and prepare them for the grinding rollers. These latter are constructed of Messrs. Fletcher's special cast-iron roller mixture shells with steel gudgeons securely forced in by hydraulic pressure.

The headstocks of the mill are so designed that the strains due to the grinding of the canes are taken up by forged steel tension bolts made of special metal, and due provision has been made for easy access to all working parts for cleaning and adjustment purposes. The gearing as mentioned above, is of steel throughout, the pinions being of solid form, while the wheels are fitted with steel segments, and all the castings are of the best Sheffield make.

The engine is of the horizontal trunk form type, 14 cylinders, 27 in. diameter by 40 in. stroke,



FIVE-ROLLER CRUSHING PLANT.



"CANE BREAKER" HOPPER AND HOPPER.
In course of erection, the rollers break up the cane, and prepare it for the main crushing rollers.

fitted with piston type valves. All the main working parts are of exceptional strength to withstand the heavy shocks experienced in cane grinding, and the wearing surfaces are proportionately large. The engine is designed for a working pressure of 120 lb. per square inch in the cylinder, and for a piston speed of 460 ft. per minute. The flywheel is 20 ft. in diameter, and weighs 17 tons.

The mill is fitted with endless band carriers for conveying the sugar canes to the first mill, and for conveying the partly-crushed canes from the same mill to that in which the final crushing is effected. In order to ensure the mills being worked to the full capacity each set of grinding rollers is fitted with a mechanical contrivance for forcing the crushed cane into the "aws" of the grinding rollers. The plant is the heaviest which has hitherto been sent out to the colonies.

Our Weekly Biography.

Lieut.-Colonel Rookes Evelyn Bell Crompton, C.B., R.E., M.Inst.C.E., M.I.E.E.

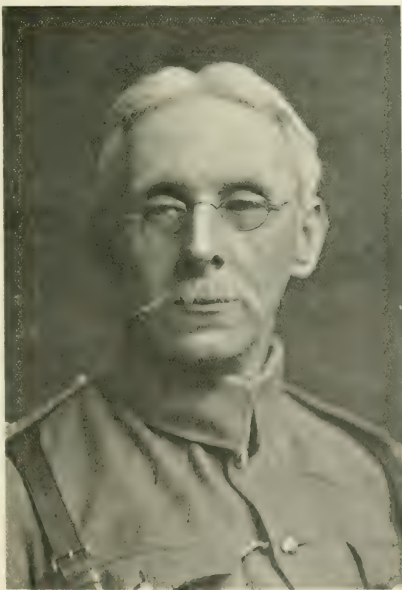
(Commanding the Electrical Engineers, R.E. Volunteers).

LIEUT.-COLONEL R. E. B. CROMPTON, who has won distinction in several fields, notably that of the supply and distribution of electrical energy in London, as well as in mechanical transport questions, was born in Yorkshire in 1845. Educated at Elstree School, Hertow, and Paris, he subsequently joined the Army, and served with his regiment for six years. In 1867 he was given a post to experiment on mechanical traction for the Indian Public Works Department. In 1870 he retired from the service, and entered into partnership with Messrs. T. H. P. Dennis and Co., of Chelmsford. The following year he became

chief engineer of the Stanton Ironworks Company, and then commenced the study of electrical developments. A year later he com-

menced the manufacture of Bürgin dynamo machines, and arc lamps, and founded the Chelmsford works. In 1881 he carried out the

first large installation of electric lighting at the Royal Courts of Justice, and about the same time brought out his invention of the compound winding of dynamo machines. He was among the first who realised that the future of the electrical industry lay in the direction of central supply stations. He became associated with the Edison-Swan Company, for whom he designed some central stations, and was entrusted with the contract for a large central station at Vienna. The



Portrait of Lieut.-Colonel R. E. B. Crompton.

LIEUT.-COLONEL R. E. B. CROMPTON.

confidence which followed on this successful Viennese enterprise paved the way for the erection of a similar power station in Kensington, the

results of which were sufficiently good to attract the attention of the investors who provided the capital for what are now the London Electric Supply Companies.

Being a frequent contributor to the discussions in the various technical societies, Colonel Crompton has been a persistent advocate of the merits of direct supply for lighting purposes, and the correctness of his views can now be realised when it is seen that most of the large supply stations are worked on the lines that he at first indicated.

Of late years he has played an important part in the question of the standardisation of engineering machinery, and has been chairman of some of the sub-committees, notably those on prime movers, generators, motors, and transformers. He has also been for some years a member of the managing committee of the National Physical Laboratory. He is a Past-President of the Institution of Electrical Engineers, and a Member of Council of the Institution of Civil Engineers, for whom he delivered the James Forrest lecture in 1905, taking for his subject "Unsolved Problems in Electrical Engineering."

Colonel Crompton, who was mentioned by Lord Roberts in his dispatches, was gazetted C.B. in 1891. He is the Commanding Officer of the Electrical Engineers, in which battalion he holds the rank of Lieutenant-Colonel. It will be remembered that during the South African War the British Government accepted the services of three hundred members of this volunteer corps. With Colonel Crompton they saw active service in the Transvaal, where their technical training proved of great value to the home forces. As a demonstration of what has already been effected in the direction of organised mobilisation of this section of our citizen-army, it is interesting to recall that, on the night of the Charing Cross disaster, at 6.25 p.m., Colonel Crompton received a call for the search-light section of his corps. The orders were issued from the headquarters, and

the sections warned at 6.35. Two sections were mobilised with two 24 in. projectors, all lamps, cables, reels, and without waiting for horse transport, these were taken through the streets by the service drag ropes, got into position, and the beams turned on the damaged roof and walls at 8 o'clock, being a total of 95 minutes from the time the call was started from Charing Cross.

Obituary Notices.

Mr. Oswald Brown, M.Inst.C.E., whose death was reported a few days since, was the son of the late Mr. Joseph Brown, K.C., C.B. He began his practical training as an engineer with Messrs. James Simpson and Son. In 1875 he became hydraulic engineer to the South Australian Government, and in that capacity designed and carried out successfully the first deep drainage scheme in Australia. Mr. Brown's work at Adelaide formed the object-lesson and basis of all subsequent Australian waterworks, and when he returned to England and started in private practice he was retained as consulting engineer in London to the South Australian Government. He was a recognised authority on waterworks engineering problems. It is interesting to note that he became a member of the Institution of Civil Engineers at the age of 31, and was thus the youngest full member received into that Institution.

Colonel Charles Lowthian Bell, brother of Sir Hugh Bell, Bart., and director of the firm of Bell Bros., Ltd., ironmasters, died at Middlesbrough on the 8th inst., after a brief illness. Deceased, who was born in 1855, was mayor of Middlesbrough in 1892, and, as colonel of the 1st North York Artillery Volunteers, he rendered good service during the South African war in raising troops for the front.

Mr. Henry W. Brock, a partner in the firms of Denny Brothers and Denny and Co., shipbuilders and engineers, died at Dumbarton on Saturday. He was identified with the development of turbine machinery, being one of the members of the Cunard Commission of experts.

Mr. Samuel Stewart, lately gas manager at Greenock, died on the 7th inst. at his residence, Broompark, Cove, aged seventy-three years.

The Electrification of the Simplon Tunnel Railway.

THE electric traction of the Simplon Tunnel Railway has for many years been the object of the studies and researches of Swiss electro-technical firms. Although the railway authorities always appreciated the advantages of electric traction in a long tunnel, they did not think these advantages sufficiently great to allow of a first application of electric traction on so important an international line as the Simplon. In course of time these opinions underwent a change, as, on the one hand, the ventilation question with steam traction was found to be a more difficult one than was at first anticipated; and as, on the other hand, proof had been shown by other electric normal gauge railways, that electricity could unhesitatingly be used as the means of traction for railways of the first importance.

The question of electric traction in the Simplon came to a head when the firm of Brown, Boveri and Co., of Baden, Switzerland, offered to have the whole of the electrical plant ready by the date of the opening of the tunnel, and to put this plant at the disposal of the Swiss Federal Railways, in order that a comparison between steam and electric traction could be made on a large scale, and on a line which is especially suited to show the special advantages of electric traction.

It so happened that this offer could only be made and discussed during the latter part of last year, and as only a limited time is left until the opening of the line, which is fixed for early summer, certain contemplated technical arrangements had, on account of the limited time, to be modified, which modifications, would no doubt not have been made if there had been a greater margin of time.

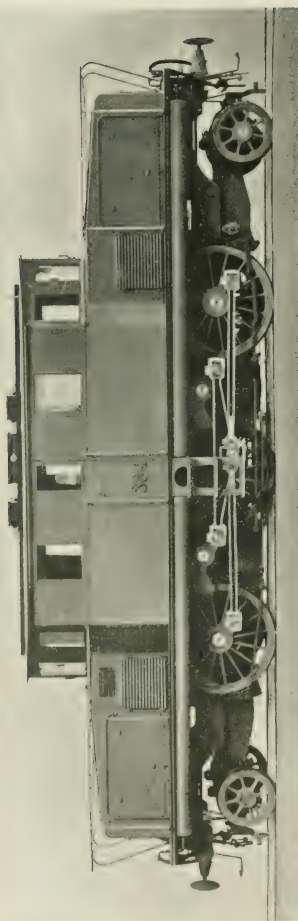
Choice of System.

Of course it was quite impossible to construct entirely new locomotives, so that the existing material will have to be made use of. Messrs. Brown, Boveri and Co. were building two three-phase locomotives, of 900-1000 h.p. each, for the Italian State Railways, and, as there was a possibility of being able to transfer these locomotives to the Simplon tunnel line with the consent of the Italian Railway authorities, the three-phase system was decided upon. Messrs. Brown, Boveri and Co. have for many years advocated this system for traction purposes, and have proved by a series of practical applications (Tramway, Lugano, 1898; Gornergratbahn, 1898; Jungfraubahn, 1898; Stansstad-Englebergbahn, 1898; Burgdorf Thunbahn, 1898; Tramway Schwyz, 1901) that it is eminently suitable for electric traction, especially for normal-gauge railways.

Details of the Installation.

The basis on which the system is to be installed is briefly as follows: At each of the mouths of the tunnel (which is about 20 kilometres long), there are hydraulic power plants, which have up to the present been used to supply power to the very extensive plants used in the construction of the tunnel. With a few alterations and enlargements, it will be possible to use these hydraulic installations which are entirely finished and ready for use, for the generation of the current for the electric traction.

In both stations, at Brigue and Iselle, three-phase current at a tension of 3,300 volts and a frequency of 15 cycles per second will be generated. As provisionally only the actual



ONE OF THE LOCOMOTIVES TO BE USED FOR TRACTION IN THE SIMPLON TUNNEL.

length of the tunnel which lies between Brigue and Iselle is to be electrified, the current generated will be conducted, without being transformed and without passing over a distance transmission line, directly to the contact line, which passes through the tunnel.

This contact line will be suspended in the tunnel itself on transversal suspension wires, which are fixed on hooks cemented into the walls. The contact line will be of the two-pole type and the return current will pass through the rails.

The transversal suspension wires will be fixed at a distance of about 25 metres from each other. It did not seem necessary for a shorter distance to be chosen, owing to the fairly even temperature in the tunnel, which excludes any considerable alteration in the sag of the transversal suspension wires. All bonding of rails will be done with the firm's patent plastic rail bonds. There will be a rail switching station in the middle of the tunnel, which will be made use of when trains, in consequence of delay, should have to cross or overtake other trains. For ordinary service no crossing of trains is supposed to take place. The shunt will also be worked electrically, and switches will be placed at its ends; these will allow the two halves of the contact line of the tunnel to be separated.

Traffic Organisation.

The organisation of the traffic has been so thought out that, on the arrival of a train from Lausanne at the Brigue station, the steam locomotive will be taken off and an electric one put on to the train, after which the train will be electrically driven as far as Iselle, where a steam locomotive will again take the place of the electric one. It is therefore, in the first instance, only necessary to electrify the rails necessary for this project, which will in certain cases amount to five sets of rails.

At the stations the masts used will be of iron, and the contact lines will, as in the tunnel, be attached to transversal suspension wires. At Iselle station where several sets of rails will have to be spanned without any intermediate supports, the catenary system, which was first used by the firm on the Burgdorf-Thun railway, in 1900, will be employed. The strain on the masts is by this system reduced to a minimum.

Locomotives.

The locomotives constructed by Messrs. Brown, Boveri and Co. have three driving axles, which will be driven by two motors by means of a system of connecting-rods, cog-wheels being omitted altogether. The motors are constructed for two speeds, viz., 34 and 68 kilometres. The drawbar pull of the locomotive at a smaller speed amounts to 6 tons and at a greater speed to $3\frac{1}{2}$ tons. The total weight is 62 tons, and the weight on the driving-wheels 42 tons.

Gradients.

On the part which is first to be electrified there are gradients up to 10 per cent. for very short distances. The up gradient on the north side, from Brigue to the middle of the tunnel amounts to about 2 per cent.; while on the south side, from the middle of the tunnel to Iselle, the down gradient amounts to 7 per cent. It will be necessary to run passenger trains with a total weight of 365 tons, and goods trains with a weight of 465 tons.

The time occupied on the journey by passenger trains from Brigue to Iselle will be 20 minutes, and in the reverse direction 30 minutes. The goods trains will take about 40 minutes in each direction. The preliminary work has already begun. The trial trips will most probably take place during the months of April and May, and the official opening of the electrical service has been fixed by contract for June 1st, 1906.

The Panama Canal Works.

The Panama Canal Commission, says the Railway and Engineering Review, has decided to try labour from the northern part of Spain, and 1,000 men from that locality will be employed. The Commission has authorised Chairman Shonts to appoint a committee to review, appraise, condemn, and dispose of the material left on the isthmus by the old French canal company. This material must be removed to make room for material needed in the construction of the canal. The annual report of the Commission states that while preparatory work has been in progress very little has been done in the way of actual excavation. Eleven steam shovels have been at different times in operation in the Culebra cut, and approximately 1,000,000 cubic yards of material have been removed. By this work two things are being accomplished. First, the levels of the cut are being put in proper condition for the installation of the largest number of machines which can be effectively operated, and, second, data are being gathered which will be useful in future estimates of the cost of canal construction. In the Culebra work 2,600 men are now employed. Railway tracks and yards have been built, and dredging has been done at both ends of the canal so far as at present advisable. All the work done is applicable to any type of canal.

Launch of the "City of Cardiff."

On Thursday, the 8th inst., there was launched by Messrs. Ropner and Son, Stockton-on-Tees, the steel screw steamer, *City of Cardiff*. The vessel has the following dimensions: Length, 342 ft.; breadth, 48 ft.; depth moulded, 24 ft. 4 in. She will be classed 100 A1 at Lloyd's, and has been built under special survey. The *City of Cardiff* is of the single-deck type, and is built on the deep-frame principle, the frames being of bulbangle steel, and the holds are clear of all obstructions to the stowage of cargo, there being no hold beams or wide stringers. She has capacity for over 1,000 tons of water ballast in her cellular bottom and peak tanks, and her measurement capacity is exceptionally large. Steam is supplied to the deck machinery by a large horizontal multitubular boiler, 9 ft. 6 in. diameter by 9 ft. 6 in. long, arranged in casing. The engines are of the triple-expansion type, by Messrs. The North-Eastern Marine Engineering Co., Ltd., of Sunderland, of about 1,300 indicated horse-power, on a very full specification, with boilers of 18 lb. pressure, and a pressure of 180 lb.

The Development of the Steam Turbine.

ENGINEERS are very cosmopolitan, and in the wide domain of scientific research there is little or no room for international jealousies. Yet, seeing that the steam turbine is essentially an English invention, it is remarkable, to say the least, that for a really comprehensive treatise on the subject in English one has to rely upon a translation of this well-known work by Wilhelm Gentsch. Notwithstanding the rapid progress made in the introduction of the steam turbine and its increasing commercial importance, the knowledge existing as to the new domain created by it is comparatively slender, and an endeavour has been made in this work not only to cover all the ground, but to treat the subject as far as possible in a more or less popular manner, but without the sacrifice of the accuracy essential in what aims at being a standard work.

It is no doubt inevitable that any work on the steam turbine should have an introductory historical chapter, and we are accordingly taken back to the year 200 B.C. for the beginnings of the turbine as we now know it.

The extraordinary feature is that after lying fallow for so many centuries the invention should in the course of comparatively few years have reached the stage of threatening the supremacy of the reciprocating steam engine for both land and marine work.

The author classifies turbines into pressure turbines and velocity turbines, and an early chapter of the book is devoted to a consideration of the former class, the author tracing the development through its various stages down to the latest type of pressure turbine. This, like the chapter on velocity turbines, which succeeds it, is to a large extent historical in character, although the matter is brought fairly up to date. As, properly speaking, every turbine combines the quantitative action of the steam with its back pressure, it is only natural that attempts should have been made to construct turbines in such a manner that the two kinds of force are exerted during separate periods, and in this way there have arisen combinations of the pressure turbine with the velocity turbine, among which per-

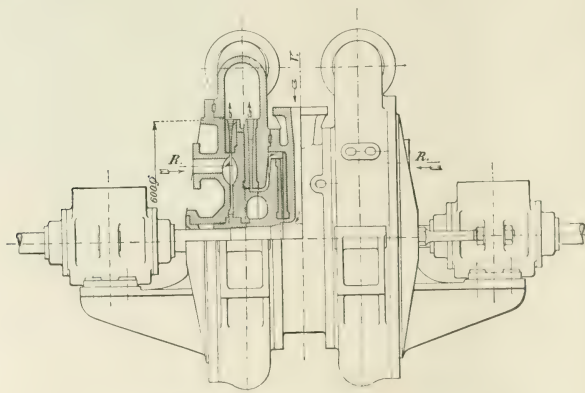
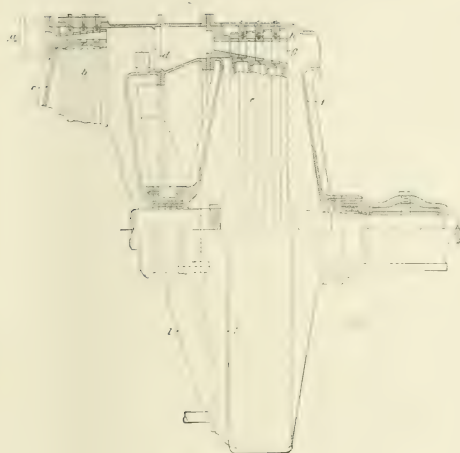


FIG. 1. SHOWING CONSTRUCTION OF SCHÜTZ PRESSURE-IMPULSE GUIDE.



CURTIS REVERSING GEAR.

the most complete is that of Hutton. In chapter 4 the author devotes some space to a consideration of the subject of counter-driven wheels, and some reference will be found to the question of friction wheels, to which, for reasons which lie wholly on the surface, but little practical importance attaches.

Reversibility of Steam Turbines.

As the author points out, the large number of revolutions per minute which have to be reckoned with in turbine work was recognised as a drawback at a very early stage in the investigation of the problem; but for practical purposes the only economical means yet discovered for reducing the speed of rotation of steam turbines is the utilisation of the energy of the steam by stages. The subject of condensation, highly important in turbine work, and the use of superheated steam are briefly discussed, as are also the problems associated with frictional resistances, estimated by Stumpf as 20 per cent. of the entire losses occurring in the turbine.

A long chapter is devoted to the consideration of governing appliances, and the methods adopted in the De Laval turbine by Olsson, and the various arrangements employed by the Curtis turbine, the Parsons

illustrated and described.

The reversibility of steam turbines is an important problem, to which a great deal of attention has been directed. We illustrate some of the various methods employed. Fig. 3 shows the Parsons arrangement where a main turbine and a reversing turbine are shown on a common shaft. The steam inlet sides of the two turbines are shown arranged next to one another. The movable vanes of this turbine are attached to the drums, which are connected by means of arms (a) with the common shaft (f) and by means of a ring (b) to the outer casing (cd). The steam streams to the main turbine through a pipe (not visible) and a channel (x) and to the reversing turbine through the pipe (y) and the channel (z). The exhaust steam passes from the main turbine at once into the case (d), which is connected by the channel (k)

with the condenser. From the reversing turbine it streams in the direction of the arrows through the drums (l and s) to the case (di). In order to effect steam tightness between the inlet channel of the main turbine and that of the reversing turbine, fixed rings are arranged at 2 and 3 alternately against the ring (v) and at the case (c) in the form of circular grooves, which produce an effectual throttling of the passing steam. Openings 4 in the ring (v) serve to carry away the condensed water, which collects between the rings, through a chamber (5) to the condenser. In the design described, the reversing turbine can also be arranged with its steam-discharge side in connection with the chamber (5) adjoining the steam-inlet side of the main turbine, in which case, then, the out-flowing steam would also escape through the openings (4) and the chamber (5) to the condenser.

Schulz Turbines.

The Schulz turbine is of great importance in the case of ships, and the Schulz turbine is characterised by the arrangement that for the attainment of as great a speed as possible,

one or a small number of turbine wreaths with the greatest possible diameters are fitted, which make a less efficient use of the speed. The style of the construction of the turbine may be seen from fig. 1. To relieve the axial pressure the current of steam entering at (*v*) for the forward motion was divided into two parts, which impinged on after the other on two multistage radial turbine bodies. For the backwards motion the steam should enter through the branch (*R*). Curtis, on the other hand, goes to work as shown in fig. 2. The inlet (*a*), which can be regulated by means of a slide (not shown), admits the steam to the first turbine (*b*), which runs in the case (*c*). From the latter the steam, directed by the slide (*d*), makes its way to the second turbine (*e*), which is contained in the case (*f*). This second turbine bears, in addition to the main vane wreath (*g*) for forward motion, an outer vane wreath (*h*) for the backward motion of the turbine. The vanes of the two wreaths are, of course, set for opposite directions of rotation, and the nozzle apparatus at the point (*k*) below, which can receive its steam directly through the pipe (*l*), and is intended to impinge on the back motion vanes of the turbine, also the nozzles which point in directions opposite to those of the forward-motion ones. In the case illustrated only the second turbine is applied to the backward motion.

Subsequent chapters deal with steam leading apparatus, working wheels, clearance space packings, and stuffing boxes. It is only natural that a considerable section of the book should be given up to consideration of the development of the steam turbine in relation to dynamos. On land, the machines for the production of electric energy are the ones in which the quickly and uniformly steam turbines reacts most advantageously. The turbine has, indeed, proved itself to be a power engine which adapts itself particularly well to the peculiarities of the dynamo, and in

this sphere has found a large radius of action for itself.

We illustrate in fig. 5 the application of the Laval turbine in connection with a dynamo on an express locomotive. The figure shows an engine combination mounted on the boiler of the locomotive of an express train. It receives steam directly from the boiler, and provides the lighting installation of the train with electric energy. The turbine in this case develops 20 h.p. This is a recent and somewhat novel application of the turbine.

Turbines for Land Travel.

For land travelling the steam turbine has not been yet used, although attempts to exploit it in this direction have been made; and yet, as the author points out, the conditions now prevailing point more and more to the introduction of this engine for the driving of vehicles. For this purpose the turbine assumes importance only when it can turn the axes without intermediate gearing, and the various power and velocity stages must be produced without such gearing.

The turbine illustrated in fig. 4 shows an attempt to solve this combination of difficult problems, although, on account of the employment of impact wheels, with repeated impingement of the motive medium, it cannot claim to work economically.

The turbine case consists of the half-globes *B C* which enclose the fixed hollow axle *D* and bear the hollow tyre *Z*. The hollow axle widens out into the chamber *A*. Lateral slits in the axle, however, lead from the chamber *A* into the chamber *E*. The steam entering through the axle *D* then fills the two chambers *A* and *E*. The working wheel wreaths *g*, having different diameters, the axes of rotation of which coincide with that of the axle *D*, are attached to a separate half-globe *h*; they are impinged from the

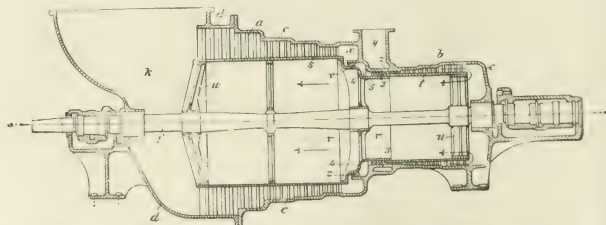


FIG. 3. ILLUSTRATING BARON'S ARRANGEMENT WITH MAIN AND REVERSING TURBINE ON THE MAIN SHAFT

nozzles t , which are influenced by cocks r . These latter are opened and closed in succession by the lever arrangement r^2 , which is actuated by the shaft e in combination with chain wheels. The working wheel wreaths k are arranged close to the half-globe B .

Application to Marine Propulsions.

Recent interest has particularly centred in the application of steam turbines for use on shipboard. One of the difficulties has been manœuvring from rest, and the requirements of war vessels in particular, which require a low coal consumption on long voyages, have stimulated the search for means by which the turbine can be turned into an economical engine for low speeds as well as for high ones.

In fig. 6 we illustrate the four-shaft triple-expansion turbine arrangement of Parsons, which is

claimed to be economical in steam and to manœuvre very well.

The high-pressure turbine A gives over its steam to the intermediate turbine B , and the latter passes it on to the two low-pressure cylinders $C D$, which discharge into the condenser. By means of the pipes $l m$, the low-pressure turbines $C D$ can, however, be fed directly, so that the outer shafts can be separately driven. The go-ahead turbines $E F$, on the outer shafts, work together, the steam from E being passed on to F .

Finally, Parsons proposes to ensure economy in working at the reduced or marching speeds, as well as at the high ones, by means of the grouping shown in fig. 7. If three-screw shafts $a b c$ be adopted, the arrangement is the following: The middle shaft

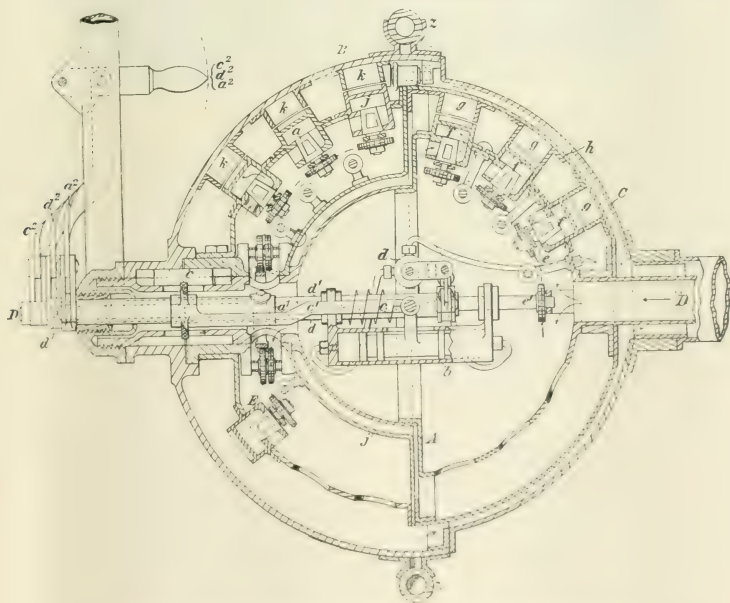


FIG. 4. SAVLEY'S PROPOSED ARRANGEMENT OF STEAM TURBINE FOR TANKCRAFTS.

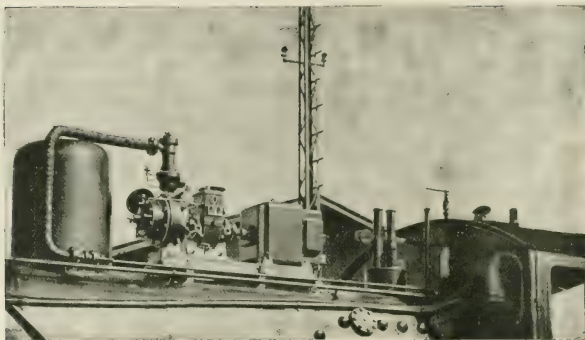


FIG. 5. LAVAL TURBINE WITH DYNAMO ON EXPRESS LOCOMOTIVE.

connected with the main high-pressure turbine *d*, and the corresponding low-pressure turbines *e f* turn the shafts *a c*. Here, however, there are two additional turbines *g h*, of which the first-mentioned is the smaller, the second one being smaller than turbine *d*, and both being of such small capacity that they can only take sufficient steam for cruising. At the slowest speed, the turbine *g* receives steam from the pipe 1. The steam then streams through the turbines *g h d (e f)* in succession, and escapes to the condensers. For a small increase of speed, additional

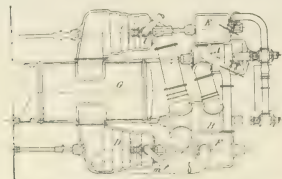


FIG. 6. FOUR-SHAFT TRIPLE-EXPANSION MARINE TURBINE ARRANGEMENT.

steam is supplied to the turbine *g* through the pipe 2, and for a further increase a supply is delivered through the pipe 3 to the turbine *h*, any back pressure that is set up towards the turbine *g* being taken up by the non-return valve 4. The turbine *h* also can,

in like manner, receive additional fresh steam through the pipe 5.

To produce full speed, fresh steam is led through the pipes 6 into the high-pressure turbine *d*, the non-return valve 7 allowing steam to run against back

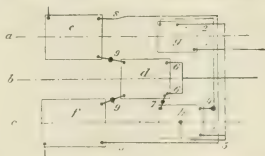


FIG. 7. TURBINE GROUPING TO UTILIZE ECONOMY AT ALL SPEEDS.

pressure towards the turbine *h*. Finally, fresh steam may be allowed to stream through the low-pressure turbines *e f*, in which case the non-return valves 9 come into action. When the turbine *d* is directly impinged, the turbines *g* and *h* can be put out of gear.

The book is copiously illustrated, and Mr. Arthur R. Liddell, who is responsible for the translation, must be given the credit of having performed his task exceedingly well.

Steam Turbines: Their development, theory of their construction and use. By William Clegg. Translated from the German by Arthur R. Liddell, with numerous illustrations. Longmans, Green and Co.

Three=Spindle Multiple Drill.

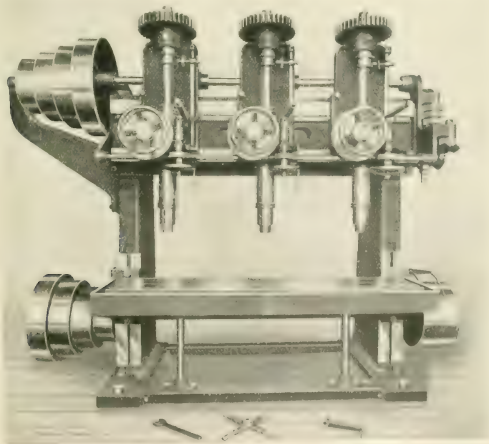
By George Swift, Halifax.

THE multiple drilling machine shown in the accompanying illustration, is designed to bore three $3\frac{1}{2}$ -in. holes in mild steel at once. The spindles, $3\frac{1}{2}$ in. in diameter with 15-in. feed, can be fed down by hand or power, and have quick release. They are balanced by means of springs and are independent, so that, if required, three different jobs can be done at the same time. The spindles have ball thrust at top and bottom, and work in long steel sleeves on which the feed racks are cut.

Practically the whole of the gears of steel, and the machine is entirely self-contained, being driven by fast and loose pulley, 24 in. diameter for a 6-in. belt, the cone being 30 in., $25\frac{1}{2}$ in., $21\frac{1}{2}$ in., and 17 in. diameter

respectively for 6-in. belt. The table rises and lowers by worm, worm-wheel, and screw; the working surface being 7 ft. by 1 ft. 4 in., with T slots cut out of the solid and an oil channel for the lubricant. The saddles are each adjustable along the cross slide by rack and pinion.

The distance between the inside faces of the cross-slides is 6 ft. 3 in., and the machine will admit from the top of the table to the under side of the spindle, maximum $38\frac{1}{2}$ in., minimum 20 in. The maximum distance between the centre of the two outside spindles is 67 in. minimum centres spindle to spindle $17\frac{1}{2}$ in. Four rates of feed by gears are provided. The net weight of the machine is six tons.



NEW THREE-SPINDLE MULTIPLE DRILLING MACHINE.

Handling of Ore in Stopes.

By D. T. Williams.

THE want of an efficient means of handling the ore in stopes is undoubtedly felt by all mines on the Rand with the exception, perhaps, of the Randfontein group and the upper levels in some of the outcrop mines, which appear to have been favoured by a kind providence. The angle of dip of the Randfontein mines averages about 60 deg., consequently no difficulty is experienced in removing ore from the stopes, and the only labour necessary is that required to clear the rock from the working faces to enable drilling operations to be resumed; this does not occupy more than about half an hour and is accomplished by the "hammer boys." Owing to this extreme angle the rocks falls by gravity to the boxes at the foot of the stope, and the cost therefore of handling rock in such stopes is practically nil. But between this angle and, say, 10 deg., as met with in many of the mines, there is a very wide range, and the relation between angle of dip and the cost of handling the ore in stopes becomes at once apparent.

The average cost of conveying the rock from the working faces to the boxes at the foot of the stope, generally speaking, is about 1s. 6d. per ton, and, should some device be introduced capable of, say, reducing this by 6d. per ton, it would represent a monthly saving of approximately £4 per tonnage, an amount well worthy of attention.

The average angle of dip along the Reef varies between, say, 10 deg. and 40 deg., in some cases more, and in others less, and it is in these mines where the greatest saving will be affected by an efficient means to handling the ore, especially in the flatter stopes, where the labour involved by shovelling will be fully realised.

In designing an ore conveyor the following features are absolutely essential to ensure any degree of success, viz. :—

Strength and durability.

Lightness of construction to facilitate handling.

Ease and rapidity with which it may be erected and dismantled.

Absence of loose parts such as bolts, pins, etc., and minimum working parts.

Several devices containing to a greater or less degree some of the features mentioned above, have been introduced, of which the following are the better known :—

Shaking shutes suspended from roof.

Stationary shutes.

Trucks operated in balance.

Trucks operated by winch.

Henderson-Tucker aerial rope gears.

Tuchtan's shaking shute supported from ground; and

Mono-rail.

A description of the appliances referred to will now be dealt with in the order mentioned.

Shaking Shutes.

Shaking or swinging shutes have undoubtedly met with greater favour than any other form of mechanical conveyor yet introduced. A large number of the mines on the Rand have equipped their stopes with these conveyors, which have given general satisfaction.

The shaking shutes certainly possess the essential feature of all successful ore conveyors, viz., simplicity of construction and freedom from working parts, as they merely consist of a length of plate bent in the form of a trough and suspended from the hanging wall by chain slings.

The shute is made up in sections, each about 15 ft. in length, and may readily be removed from the stop, to prevent injury during blasting operations, and are as readily re-erected.

The chief disadvantage with this description of ore conveyor is the difficulty of getting the holes drilled in line and properly spaced, and the disadvantages resulting therefrom. When the hanging wall presents an irregular contour, some difficulty is experienced in getting the holes properly pitched, with the result that the hanging or suspension chains tend to pull against each other instead of producing a harmonious swinging motion. This difficulty is much more marked in narrow stopes, where the chains are comparatively short and where a few inches difference in the hanging bolt centres seriously affects the swinging motion of the shutes.

Another disadvantage is that each time it becomes necessary to remove the shute to another position in the stope fresh holes have to be drilled in the hanging wall, and in many cases new hooks must be supplied.

Stationary Shutes.

Between the angle of repose and that at which the ore will freely run by the aid of shovelling, stationary shutes are perhaps unequalled, but unfortunately it is here, and here only, they can meet with any favour.

These shutes are similar to the shaking shute, with the exception of course that no chains are necessary, being merely laid upon the foot wall. In stopes having a dip of about 30 deg., and upwards no difficulty is experienced in the ore sticking, provided the ore handled is perfectly dry and the shute free from any wet fines, which materially affects the coefficient of friction between the ore and the shute.

The shutes are made in section of about 10 ft. in length, and $\frac{1}{8}$ in. thick, so that they may be conveniently handled, and each length is lapped over the lengths in advance and held by bolts passing through both shutes.

This type of shute is extremely efficient in stopes where the angle of dip is such that shaking shutes are unnecessary, and possess the advantage of being perhaps the cheapest and simplest form yet introduced. Another decided advantage possessed by these shutes is the fact that they need not be removed while blasting, as they can be protected from injury by merely piling up ore on either side, which of course may be allowed to remain until it becomes necessary to remove the shute to another part of the stope.

The only disadvantage that may be placed against this system is its unsuitability for stopes having a dip of less than 30 deg. or more than 40 deg., consequently only a very narrow margin for its use remains.

Truck Systems.

The truck system of haulage has been tested on several mines with varying success, depending upon the conditions. The trucks used for this purpose are generally constructed somewhat shallower than the ordinary cocopan, but otherwise similar in design and of the same gauge.

The chief disadvantage of this system is that it is not practical in stopes of, say, less than 4 ft. 6 in. in width, this being due to the fact that fully 18 inches is necessary above the top of the truck for loading purposes.

The trucks are run upon ordinary rails of 12 to 14 lb. section, and are either operated by means of a winch at the top or foot of the stope, or run in balance with a brake wheel at the top of the stope, the loaded car descending, and of course hauling the light car to the top for loading.

With the truck system, whether operated by a winch or run in balance, the chief advantage lies in the fact that no boxes are necessary at the foot of the stope, as the cars are run into the level either upon flat sheets or turntables, unhitched, and taken to the main bins, where they are relieved of their contents and returned to the stope. Another

advantage worthy of mention is that no time is occupied in erecting or dismantling the gear, as the cars are simply run out of the stope, and the rails suffer little or no damage if left in the stope during blasting operations.

Henderson-Tucker Aerial Rope Gears.

The Henderson-Tucker Conveyor is constructed upon the aerial rope principle, and from the results obtained seems to have amply justified its introduction.

The highly satisfactory results obtained in the Geldenhuys Estate cannot but fail to attract attention. The extremely low cost of removing the ore from the working faces to the boxes, as shown in the table, must impress all with the possibility of effecting considerable reductions in the cost of handling ore in stopes, provided, of course, that the apparatus is suitably designed to meet the peculiar conditions under which it has to operate.

The stopes of the Geldenhuys Estate are particularly well suited for the mechanical handling of the ore, as will be seen by reference to the table, their average stoping width being 6.97 ft. A number of their stopes are, however, extremely flat, varying between 5 deg. and 10 deg.

The details of this gear are designed to meet the requirements of work in the stopes. The skip is carried upon a wire rope strained between two points, one of which is fixed over the boxhole the other being secured to an ordinary machine bar, which may be moved to any portion of the stope as required.

The loaded skip descends the stope by gravity and is hauled back to the loading point by means of a small winch clamped to the bar, and which may be operated by means of an air or electric motor or by hand power. When the skip arrives at the loading point it is held by means of a break on the winch. On the completion of loading, the pressure on the brake lever is reduced and the skip

allowed to descend at the highest possible speed consistent with safety.

This gear is suitable for stope of any length and is equally efficient in long stopes as in short. When the span of the rope, however, exceeds say, 100 ft., it becomes necessary to support the rope to prevent excessive sag. This is accomplished by means of jumper arms lamped to an ordinary machine bar.

The tipping is accomplished automatically by means of a lug riveted on to the skip body and which comes in contact with a piece of piping arranged diagonally to the rope at the required dumping place.

The necessary tension is put on to the rope by means of tighteners, one end of which is secured to the bar and the other to the rope.

This gear may be dismantled in about 15 to 20 minutes, and erected in about 30 minutes, irrespective of the length of the stopes.

Another advantage possessed by this gear, is the ease with which it may be moved from any one point in the stope to another: this operation only occupies, say, 10 to 15 minutes.

During blasting operations it is only necessary to remove the skip and slacken the rope, which may be accomplished in a few minutes.

Tuchan's Shaking Shute.

The latest introduction in the form of ore conveyors for stopes is the Tuchan's Shaking Shute, one of which was recently installed at the Village Main Reef, and, after a series of tests, proved highly satisfactory.

It is constructed substantially upon the principle of the swinging shute, but, instead of being suspended from the hanging wall, is supported in a frame made of a very slight section of angle iron. It is made in lengths of 8 ft., and any one section can be easily handled by two boys. The shute is supported at the top end of each frame by means of a U-shaped hanger on which the shute rests. The hanger is constructed of about $\frac{3}{4}$ in. round iron, and the shute is fitted with two lugs

| No. | Name | Capacity, tons per day | Cost, \$ | Remarks | Method | One Removed from Working | No. of Stopes Worked | No. of Boys Employed | Weight, tons per foot | Weight, tons per foot | Average Stope Width |
|-----|--------------------|------------------------|----------|---------|---------|--------------------------|----------------------|----------------------|-----------------------|-----------------------|---------------------|
| 1 | Robinson G. M. | 120 | 35 | 21 352 | 15 183 | Mech. and Hand | 200 | 1,570 | 7 85 | 96 715 | 11 |
| 2 | Ranallotons | 150 | 60 | 173 | — | Hand | 400 | 3,600 | 9 | 10 07 | 13 |
| 3 | Geldelotons Estate | 150 | 21 | 17 06 | 5 146 | Mech. and Hand | 120 | 900 | 7 5 | 7,1416 | 6 97 |
| 4 | Village Main Reef | 150 | 29 | 17 182 | 12 75 | Chiefly Hand & Factor | 160 | 1,725 | 10 78 | 8 8 158 | — |
| 5 | City & Suburban | 225 | 30 | — | — | Hand | 160 | 1,397 | 8 73 | 7 0 833 | 3 5 |
| 6 | Treasury | 225 | 15 | 3 | 2 6 | Mech. and Hand | 60 | 600 | 10 0 | 10 3 | 1 5 |
| 7 | Robinson Deep | 225 | — | 2 4 | 1 8 | Shaking Shute & Hand | 200 | 1,746 | 8 73 | 11 3 | — |
| 8 | Sumner A. L. East | 225 | — | 2 2 765 | 4 3 380 | " | 100 | 1,021 | 10 21 | 10 7 115 | — |
| 9 | Glen Deep | 230 | 30 to 40 | 2 36 | 1 6 49 | Mech. and Hand | 100 | 1,241 | 12 41 | 12 6 | — |

COMPARISON OF COSTS.

which fit over this and form a bearing, the other end of the shute overlaps the adjoining section and is supported by it in the same way.

To compensate for the irregularities in the foot-wall, adjustable lugs are fitted to the frame, so that no difficulty is experienced in securing perfect alignment.

The U-hanger of the top section is fitted with a lever arm which is depressed by a boy; this provides the necessary swinging motion for the shute. In the top section is also provided a spring bumper, which gives a sudden jerk to the shute and considerably increases its efficiency, especially in flat stopes; in fact this conveyor works with surprising results on perfectly level ground, and has practically settled the question for flat stopes. The whole gear has been most carefully and ingeniously designed, and all bolts, pins and working parts producing friction, carefully avoided.

A distinguishing feature of the conveyor is its adaptability for working in narrow stopes, as it does not stand when erected complete more than 18 in. above ground level, and with the exception of the stationary shute, would be capable of working in much narrower stopes than any gear yet introduced, in addition to the fact that it operates with marked efficiency in extremely flat stopes, and where the stationary shute would be useless. Another feature worthy of note is the ease with which it may be moved from any one position to another, as no holes have to be drilled for its support in the hanging wall.

Unfortunately, no figure showing the saving effected by its use are yet obtainable, but during a trial it was proved that one boy was capable of doing ordinarily the work of six, and we may therefore look forward to some very promising results.

Owing to the Village Main Reef having only installed one of these conveyors, which was manufactured by them at the mine, it cannot be

expected that their costs of conveying the ore from the working faces to the boxes would be much affected thereby, but the manager, Mr. R. Raine, reported very favourably upon it, and I believe it is their intention to install this type of conveyor in many of their stopes as soon as satisfactory arrangements have been made for its importation.

Mono-Rail.

In view of the very excellent and instructive papers recently read by Mr. Wager Bradford before the South African Institute of Engineers, any remarks of mine relating to this method, after the exhaustive treatment it received, would be superfluous. I therefore refer those interested in this question to a careful perusal of the above.*

The Question of Cost.

The writer has endeavoured to prepare a comparison of costs, relating more especially to the handling of ore in stopes from a few of the representative mines of the Rand, and which will undoubtedly prove of interest, such having been arranged according to the length of the stopes.

The relation between the lengths of stopes and cost of handling ore in same is closely related, and forms a subject of considerable interest, although complex in nature. It is perfectly obvious to all that the cost of shovelling ore over a distance of, say, 220 ft., must be considerably higher than shovelling the same amount of ore over a distance of, say, 100 ft., presuming, of course, the angle of dip in each case is the same. The angle of dip forms an important point in this consideration, and, in deciding upon the length of the winzes or stopes, plays an important part. No hard and fast law, however, appears to have yet been formulated governing the length of stopes, as reference to the accompanying table shows that the stopes of the Village Main Reef,

with an average angle of dip of 29 deg., are only 150 ft. in length, whereas the Glen Deep, with an average angle of dip of 29 deg., are 230 ft. long. The comparison of cost is also marked, as the cost of conveying the ore from the working faces to the boxes on the Village Main Reef is only rs. 2'75d. per ton, whereas the costs on the Glen Deep with its 230 ft. stopes, is rs. 6'49d. per ton. It must also be noted that the Glen Deep adopts mechanical means as well as hand shovelling for conveying the ore.

An item worthy of notice is that of the Geldenhuis Estate, where the cost for conveying the ore from the working faces to the bins is only 5'146d. per ton, and it may further be mentioned that the stopes of this mine are extremely flat, averaging only 21 deg. This mine is practically equipped throughout with the Henderson-Tucker Aerial Gear, and indicates very forcibly what it is possible to accomplish by means of a device for handling ore in stopes adapted to the conditions of the mines.

It is also interesting to note the saving in the number of boys per stamp in the case of the Geldenhuis Estate, this being only 7'5 against an average of, say, 9 in the other mines.

Attention is drawn to the figures of the Treasury Gold Mine, where the cost of removing the ore from the working faces to the bins and boxes, given as 3s. and 2s. 6d., respectively, may at first appear somewhat high, but it must be remembered that many of the stopes are perfectly flat, and in some cases rising to the south, so the amount of labour involved in shovelling ore in stopes of this description must naturally be a big item. On reference to the table it will be observed that the average angle of dip throughout the mine is only 15 degrees and considerably less than any of the mines recorded, and, in addition to this, their average stoping width is only 45 in. Taking all the points into consideration, their mining costs will not appear to compare very favourably with those of other mines.

* *Vide* PAGE'S WEEKLY, Feb. 2nd.

Principles of Construction.

The principle upon which stope conveyors are constructed is worthy of mention, and may be divided under two heads, viz., continuous and intermittent, ore shaking shutes being representative of the former and the aerial or truck gear representing the principle of the latter.

The advantages of the continuous system over the intermittent are obvious, as a continuous flow of ore is obtained equal to the rate at which the ore is shovelled into the shutes, and the output of such a gear must therefore be greater than that of a travelling skip or truck. Another feature of this system is the advantage possessed, owing to the fact that a larger number of boys may be put to work on one conveyor of the continuous system than is the case with any intermittent gear, and filling of the shute may be carried on at any portion of the stope within reasonable distance from the shute, whereas, with the intermittent gear, the points of loading are more or less fixed.

In gears of the intermittent type the time occupied for the truck or skip becomes a serious question, more especially in long stopes, where considerable time is occupied in accomplishing the trip; this, however, is very much reduced by the introduction of running skips or trucks in balance.

It would appear that the shaking shute must suffer a serious disadvantage owing to the severe wear upon the shute due to the sliding ore, but this has been proved in actual practice not to be such a serious consideration as it would first appear, especially when we consider the nature of the ore. Shutes, of course, do wear out, and rapidly, but a large percentage of the cases where they have to be replaced is due to other causes, among which is neglect to remove them from the stope during blasting.

From a paper read before the Transvaal Institute of Mechanical Engineers.

Mining Personal Pars.

Dr. F. H. Hatch, M.Inst.M.M., the consulting engineer to Messrs. LEWIS, LEWIS and MARKS, is leaving the Rand early in March and coming to London. He will be succeeded by Mr. C. B. Kingston, M.Inst.M.M., who has been in charge of Messrs. Lewis and Marks' mining interests in Italy.

Mr. Stephen J. Lett, Assoc.Inst.M.M., F.C.S., left England on the 5th inst. to take charge of prospecting and development work in Portuguese East Africa.

Mr. C. G. Warnford Lock, M.Inst.M.M., F.G.S., having returned to Singapore from a three month's tour of inspection and exploration in Kemaman, one of the little known Independent States of the Malay Peninsula, has since been engaged for about a month in reporting on extensive tin mines in the neighbourhood of Raub. Mr. Lock has accepted the representation of Messrs. Charleton, Dickinson and Co., in the Far East.

Mr. E. Duffield McDermott, Stud.Inst.M.M., has returned to London after a two years' engagement at the El Oro Mine, Mexico, and is leaving again for a short trip to Arizona.

Mr. W. P. Rutherford, Junr., Assoc.Inst.M.M., A.R.S.M., has just returned from Japan, where he had for several months been reporting on the copper mines of that country.

Mr. W. H. Trewartha James, M.Inst.M.M., has just sailed for Australia on business in connection with the properties in which his firm is interested.

During the past four weeks additional engines of the "consolidation" type (2-8-0) have been constructed at the Swindon G.W.R. works, whilst the Wolverhampton shops have produced some more of the passenger branch type of engine. An order has just been issued to the latter shops for further engines of the same class, except that the wheels will be 4 ft. 7½ in., cylinders 17 in. by 24 in., and the boiler pressure 180 lb. per square inch, compared with 4 ft. 1½ in. wheels, 16 in. by 24 in. cylinders, and pressure 165 lb.

A new cell has just been added to the Horsfall destructor at Luton. The Corporation now possesses a three-cell destructor, capable of satisfactorily dealing with forty-five tons of ordinary refuse per day. The steam produced by the destructor is utilised for pumping the sewage, and thus effects a large saving in coal. The new work was carried out under the able supervision of S. F. L. Fox, Esq., C.E., Borough Engineer at Luton.

The Dockyards and the Navy.

AN important step towards the consummation of the Admiralty's scheme regarding the manœuvres next June has been taken by the London underwriters. The members of Lloyd's have resolved to assist the Admiralty by every means in their power, and no doubt is felt, says the Central News, that the large marine insurance companies will also come into line. This decision will, it is believed, have the effect of paving the way towards securing the active co-operation of the leading shipowners in the Admiralty scheme.

The plans approved for the new American battleships *North Carolina* and *Michigan* show that each ship will have a main battery of eight 12 in. guns mounted in pairs in four turrets, two forward and two aft, and there will be an additional pair of turrets amidships, one turret overtopping the other. These battleships will carry no secondary battery except eighteen 3 in. guns in order to repel torpedo attacks.

The *Attentive*, the last of the eight scouts ordered to be built for the Royal Navy by contract, has arrived at Sheerness from the works of Messrs. Armstrong, Whitworth and Co., where she was laid down on January 8th, 1904. Built with a length of 374 ft., and a breadth of 38 ft. 3 in., she has a displacement of 2,940 tons, and is fitted with engines of 16,000 h.p., supplied by Messrs. Hawthorn, Leslie and Co., and capable of propelling her at a speed of 25 knots per hour. The *Attentive* has been equipped with ten 12-pounder and eight 3-pounder quick-firing guns, and her cost, including armament, will exceed £275,000.

It is understood that the slip from which the *Dreadnought* was launched on Saturday will be shortly enlarged and occupied by another vessel. Portsmouth and Devonport are the only yards which possess docks capable of taking vessels of the *Dreadnought's* size, and it is probable that a new ship will be assigned to each of these establishments every twelve months. An attempt will be made to complete each new unit in two years instead of three, the net result being that if the present Government abide by their predecessor's shipbuilding policy, and four large armoured ships are laid down, there will be a very regular demand for labour in both dockyards.

In the Royal Dockyard at Pembroke the gravest anxiety is being felt as to the future of the yard, says

the Tribune. Machinery originally intended for that yard is still being diverted to Gibraltar and other yards; and with the *Duke of Edinburgh*, improved cruiser, built there, commissioned, and going away on February 20th, and the *Warrior*, completed in July next, there is every prospect of a very considerable reduction of the establishment. It is understood that permission for building submarines at Pembroke will be made in next year's Estimates, but even in that case it would only find employment for some 400 or 500 men, in place of the nearly 3,000 now at work there.

According to present arrangements, the Japanese warship *Kashima*, launched at the Elswick yard in March last year, will be placed in Messrs. Stephenson's dock, so that her bottom may be painted and her under-water fittings examined. She will afterwards be taken to the buoys, and her bunkers, which hold about 2,000 tons of coal, will be filled, preparatory to the ship being taken to sea for her official trials. These will probably take place within the next two months. The *Kashima's* speed is 19 knots. On the completion of the trials the ship will return to the river, where the necessary painting and upholstering work will be carried out. The vessel will have a complement of 800 officers and men. Special precautions were taken for her passage down the Tyne.

As to the effect of the *Dreadnought* upon the naval programmes of other nations, it is to be noted that all the great foreign navies are already projecting or constructing monster battleships. In Japan the *Satsuma* and *Aki* are building. In France three battleships of 18,000 tons are to be laid down. Germany, under her new Navy Bill, has sixteen huge battleships in contemplation, it is said of 19,000 tons displacement; and in America the *North Carolina* and *Michigan* follow the same general line. The 12-in. gun seems likely to find universal adoption in preference to a lighter weapon of higher velocity. It seems likely that the ships of the future will naturally fall into two classes: (1) battle-ships; (2) torpedo craft. Battleships like the *Dreadnought* will probably carry only one type of big gun and one type of small gun for repelling torpedo attacks, while there is also a marked tendency to increase armoured protection above and below the water line.

Our Review of the Week.

From Our Own Correspondents.

Scotland.

GLASGOW.

Interesting Labour Circular.—The following statement, which has just been issued to the agents of the affiliated members of the General Federation of Trade Unions, is of interest to all Amalgamated Engineering Trades' members.

"Fellow Trade Unionists.—The question you are called upon to decide by recording your vote on the accompanying ballot paper is as to whether you are prepared to enforce the payment of wages weekly by ceasing work, if necessary. In the event of your answer being in the affirmative, it will be the duty of your representatives to communicate with the employers, notifying them of your decision. This may result in a satisfactory settlement, but without the authority to inform the employers that you are prepared to cease work on the question it is idle to communicate with them again. If ever workmen have shown patience and a desire to settle a difference with employers amicably, it is upon this question of weekly wages. For eight years the movement has been going on; conference after conference has been held and even when the employers, after the year's trial of weekly pays, again reverted to the fortnightly system, you bore the indignity and inconvenience without adopting drastic measures. All other workmen in every other district, and even employers and the general public, cannot understand why weekly pays should be withheld. Enough time has been devoted to trying to induce the employers to concede the demand. We will take your vote in the affirmative as an instruction to move ahead and as a decision on your part that if weekly pays are not conceded you are prepared to cease work. We will take your answer in the negative as an instruction to drop the whole movement."

The vote is returnable on February 28th, and the following are the names of the affiliated societies: Society of Engineers, Amalgamated Machinists and Millwrights, Amalgamated Society of Turners and Pattern Makers, Amalgamated Society of Carpenters, Associated Blacksmiths, Associated Carpenters, Associated Iron Moulders, Associated Shipwrights, Boilermakers, and Iron and Steel Ship Builders,

Brassfounders, Furnishing Trades' Union, House and Ship Painters, Machine Workers' Union, Scottish Sawmill Operatives, National Union of Smiths and Strikers, the National Amalgamation of Labour, and the National Union of Plumbers.

Clyde Navigation Trust. At the recent meeting of the Clyde Navigation Trust a report was submitted by the Workshops Committee with reference to the reinstatement on a new site of the workshops at Dalmuir, rendered necessary by the sale of the ground. The committee were of opinion that the contemplated site on the Trustees' property at Renfrew at the mouth of the Pudzeoch is a suitable one, and they recommended, subject to an agreement with the Burgh of Renfrew, as to the ultimate line of quayage on the west side, that the land area should have a river frontage of 550 ft., and should occupy nine acres, and that the construction of wharfage and crane seats and slips should be proceeded with as soon as possible. They further recommended that experts should be employed to advise with the sub-committee and the mechanical engineer in considering as to the most economical machinery and power for the various purposes.

Shipbuilding Orders.—Messrs. J. and J. T. Mathews, of Tornoto, have just placed an order with Messrs. Robert Stephenson and Co., Ltd., Newcastle, for a steamer, specially designed for bulk cargo and package freight of the Great Lakes and St. Lawrence River service. The vessel will be built to highest class British Corporation, and under the supervision of Messrs. John Reid and Co., Glasgow and London.

Messrs. R. Duncan and Co., ship builders, Port-Glasgow, are reported to have contracted to build a steamer of average size for Messrs. Bruce and Co., shipowners, Glasgow. Messrs. Muir and Houston, Glasgow, supply machinery.

The Clyde Navigation Trust have just contracted with English owners for a steamer of over 3,000 tons dead-weight.

It is reported that Messrs. Watt and Co., Glasgow have placed an order with Messrs. James and Miller, Old Kilpatrick, for the construction of a steamer of about 5,300 tons dead-weight.

Institution of Civil Engineers—Glasgow Students.

—At the meeting of the local association of Students of the Institution of Civil Engineers, held February 5th, in the Institution Rooms, Bath Street (Mr. D. A. Matheson, M.Inst.C.E., in the chair), a paper was read by Mr. G. W. F. Gardner, M.Inst.C.E., on "Notes on Earthwork in the Construction of Railways." Mr. Gardner first dealt with the consideration of location of line of railway to suit the earthwork, and gave examples of lines recently carried out to show how the earthwork was dealt with. After emphasising the importance of executing drainage of adjoining lands previous to commencement of earthwork, Mr. Gardner described the general methods of excavating cuttings and forming embankments, with descriptions of the types of steam diggers in use. In conclusion, Mr. Gardner discussed the question of slips in cuttings and embankments, giving examples of these and how they were dealt with.

Messrs. William Jacks and Co., iron and steel merchants, Glasgow, Middlesbrough, and London, have taken into partnership Mr. Robert Hetherington and Mr. H. Arnold Wilson, who have been associated with the firm in the business for a long number of years.

Dundee Electrical Schemes.—At the present moment Dundee municipality has under consideration the question of improving the electrical supply, both as regards power for lighting and traction. Recently the electrical engineer submitted a scheme, which included the provision of a new power station at the harbour, and it was estimated that this would cost £70,000. On account of the large sum involved, the town council have been somewhat chary regarding it, and the tramway manager has since reported that the requirements of the tramways could be met by the provision of a new station at the central depot, and this, with equipment, he estimated to cost £17,000. Various objections were taken to this proposal by the electrical engineer at a meeting of the Electrical Committee held on Monday, and it was stated that such a modified scheme would not meet the requirements of the town.

Ferro-Concrete Construction.—At the Royal Scottish Society of Arts meeting on Monday, in Edinburgh, Mr. F. A. Macdonald, Glasgow, read a paper on "Ferro-Concrete: A Scientific Method of Employing Concrete and Steel in Construction." The paper was illustrated by lantern slides of diagrams, etc.

A Destructor for Greenock.—A deputation of Greenock Corporation appointed to inspect destructor installation has prepared an elaborate report on results of visits paid to Glasgow, Ayr, Fulham, Hackney, Liverpool, Mansfield, Nottingham, and Partick.

North-East Coast.

NEWCASTLE-ON-TYNE.

The shipwrights employed in the shipbuilding yards of the North-East Coast have intimated that they have agreed to accept the advance of wages preferred—*is. 6d.* on time and 5 per cent. on piece rates—to take effect on the first full pay in March.

The drillers employed in Tyneside shipbuilding yards have also accepted *is.* on time and 5 per cent. on piece rates.

Proposed School of Naval Architecture.—The Armstrong College, Newcastle, is moving with the times. Only recently the council resolved to establish a chair of electrical engineering, and the appropriation of a considerable sum for the equipment of new laboratories. It now appears likely that a complete School of Naval Architecture will shortly be established in connection with the College. The project is one that naturally appeals to the shipbuilding interests of the North, and it will also, it is said, receive the support of the committee of Lloyd's Register of Shipping, who have undertaken to establish three scholarships in connection with the school of the value of £50, tenable for three years. It is stated that half the amount required to establish the school is already covered by *subscriptions*.

North Country Coke Burners' are quite at a loss to account for the ability of German makers to supply coke to west coast blast furnaces at 20s. 9d. per ton, which is certainly as low a rate as fuel can be sent from the Durham coke-ovens. It is admitted, however, that every week this year one shipload at least (about 2,500 tons) of German coke, has been delivered at Barrow at the price named.

Messrs. Yarrow's Removal.—Messrs. Yarrow and Co., it is stated, have completed their arrangements for removing their well-known engineering and shipbuilding establishments from the banks of the Thames. A new site—believed to be on Tyneside, near Newcastle—has been chosen, and the process of removing will be commenced in about six weeks' time.

Messrs. Robert Stephenson and Co., Ltd., of Darlington, are now engaged upon a second lot of powerful six-wheeled bogie express engines for the Oudh and Rohilkund State Railway, for which system the Vulcan Foundry, Ltd., of Newton-le-Willows, Lancashire, have recently delivered no fewer than fifty heavy freight locomotives, whilst the last-named firm have also built twenty-six six-wheeled goods engines for the Eastern Bengal Railway.

Battleship "Kashima."—The battleship *Kashima* left at the Elswick shipyard for the Imperial Japanese Navy, left her moorings at the yard on Friday for Pelaw buoys, preparatory to her being docked at Hebburn. Messrs. Robert Redhead and Son, of Quayside, Newcastle, had the towage contract, and they had five steam tugs in attendance on the ship, two at the bows, two aft, and one acting as tender. After being taken into the southern channel, the *Kashima* partly under her own steam and assisted by the tugs, went slowly down stream, the tugs *Ben Ledi* and *Malta* having the stern hawsers. The remaining tug, *Harwich*, steamed ahead of the warship and her attendants. The *Kashima* was safely moored at the special warship buoys at Pelaw by 4 o'clock in the afternoon.

The Newcastle-upon-Tyne Association of Students of the Institution of Civil Engineers held on Friday last, in the County Hotel, Newcastle-upon-Tyne, their fifteenth annual dinner. Mr. James Walker, F.R.S.E., M.Inst.C.E. (President of the Association), presided, and among those present were the Mayor, Alderman Baxter Ellis, Sir Alexander Binnie, M.Inst.C.E., Sir A. B. W. Kennedy, Professor Louis, Professor Weighton, Dr. J. H. T. Tudsbury, M.Inst.C.E., Professor W. Thornton, the Hon. C. A. Parsons, and a large number of other members of the Institution.

The New Wear Bridge.—The work of constructing the new bridge over the river Wear will be pressed more rapidly forward this year. The official estimate of North Eastern works in progress gives the amount expected to be expended on the new bridge in the first half of this year as about £70,000. The total cost of the bridge is put as about £320,000. The new high-level bridge which is in course of construction will, it is understood, cost nearly half a million of money. The engineer's estimate for the superstructure was about £120,000, and the cost of the approach piers, the temporary construction, and the cost of the land and water works, is said, bring the outlay upon the structure up to the £200,000.

Local Shipbuilding.—The *Sunderland*, built by Messrs. John Redhead and Sons, West Docks, Sunderland, for the Hain Steamship Company, Ltd., St. Ives, was launched from the shipbuilding yard of Messrs. John Redhead and Sons, West Docks, Sunderland, on Friday last. The vessel is of the following dimensions: Length, 358 ft. 6 in. overall; breadth, 49 ft. 6 in.; depth moulded, 27 ft. 11 in. The *Treneglos* will be fitted with triple expansion engines, also constructed by Messrs. John Redhead and Sons.

The *Annie Melling* has been launched from the shipbuilding yard of Smiths Dock Company, Ltd., North Shields. She is a steam trawler of the following dimensions: Length, 125 ft. by 21 ft. 6 in. overall; breadth, 14 ft. 6 in. The vessel has been built to Lloyd's highest class, and will be fitted with engines supplied by the Shields Engineering and Dry Dock Company, Ltd., North Shields.

Messrs. William Gray and Co. launched on Friday the screw steamer *Rubens* for the Bolton Steam Shipping Company, Ltd., London. She will take the highest class in Lloyd's, and is of the following dimensions, viz.: Length, overall, 37 ft. 6 in.; breadth, 14 ft. 6 in.; and depth, 25 ft. 5 in., with long bridge, poop, and topgallant forecastle. Triple expansion engines are being supplied by the Central Marine Engine Works of the builders.

On Friday afternoon, a new screw steamer named the *Treneglos*, built to the order of the Hain Steamship Company, Ltd., St. Ives, was launched from the shipbuilding yard of Messrs. John Redhead and Sons, West Docks, North Shields. The vessel is of the following dimensions: Length, 358 ft. 6 in. overall; breadth, 49 ft. 6 in.; depth moulded, 27 ft. 11 in. The *Treneglos* will be fitted with triple expansion engines, also constructed by Messrs. John Redhead and Sons.

Messrs. John Blumer and Co., North Dock, Sunderland, launched on the 9th inst. the screw steamer *Olicemoor*, for Messrs. Walter Runciman and Co., of Newcastle and London.

On Friday last the steel screw steamer *Century*, built by the Northumberland Shipbuilding Company, Limited, Howdon-on-Tyne, to the order of Messrs. Furness, Withy and Co., Ltd., West Hartlepool, for Messrs. Howard, Smith and Co., Ltd., London, left the Tyne for her trial trip. She has been constructed with a view to rapid speed and economy in fuel, and the machinery has been supplied by Messrs. Richardson, Westgarth and Co., Ltd., Sunderland, consisting of engines with steel boilers, 14 ft. by 16 ft. 9 in., 180 lb. working pressure. The steamer will carry about 7,250 tons dead-weight.

The "Golo," a passenger steamer, just completed by Swan, Hunter, and Wigham Richardson, Ltd., went to sea for a trial trip on Thursday, the 8th inst. The vessel is 265 ft. in length, by 34 ft. beam, and has been built to the order of Messrs. Fraissinet and Co., of Marseilles, for their mail and passenger service between Corsica and Nice. The triple expansion engines, on the Yarrow, Schlick and Tweedy system, together with the

builders have also been built by Swan, Hunter and Archibald, Richardson, Ltd. Despite a rough sea and a strong wind a speed of over 12 knots was attained. On the following day, Friday, the 9th inst., Swan, Hunter and Archibald, Richardson, Ltd., launched the *Dochra*, which they are building to the order of Messrs. Japp and Kirby, of Liverpool. She is 36 ft. in length by 40 ft. beam.

Yorkshire District.

SHEFFIELD.

Yorkshire Engineering Trades.—The progress of the Yorkshire engineering trades, although somewhat retarded by the general election, continues to be generally satisfactory. In the Leeds district business in finished iron and steel keeps steady, and the recent advance in prices has had no appreciable effect on the demand. A healthy tone is maintained in the general engineering and machine-tool industries. The South Yorkshire Bar-Iron Association have again increased prices, but ironmasters' profits are reported to be very small. The Sheffield iron makers and merchants are optimistic for the immediate future. A good deal of buying is going on, but makers are not inclined to accept contracts, except at enhanced prices. A good business is being done by the makers of the various brands of high-speed steels, a considerable quantity being shipped to America.

Sheffield.—All the Sheffield works are, more or less, at full pressure, and it is interesting to note that, notwithstanding the expedition with which orders can now be completed, new bookings maintain a satisfactory volume and more are in prospect. The South Indian Railway Company require 210 pairs of wheels and axles, and a large quantity of laminated springs, while the 100 steel goods wagons for which tenders are invited by the same company, should mean that some of the necessary material will be provided here. The East Indian Railway Company require cast-iron plates and jaws. A number of the mills and forges are running double shifts. Manufacturers of Bessemer and Siemens steels are booking contracts for forward delivery, and experience no difficulty in maintaining current rates. The crucible steel trade seems to have received a check. With the disappearance of the probability of a boom, consumers are content to buy to meet current requirements, and there is less ordering ahead. Competition for business is still extremely keen. There is continued demand for all classes of Swedish iron and steel, and deliveries are coming to hand more freely.

Leeds District.—The strength of the pig-iron warrant market up to the end of last month had raised expectations of an advance in the price of finished materials in the Yorkshire district, and circulars had been prepared for an advance of 3s. per ton on merchant bars, but these had been withheld. Since then the rates for Cleveland warrants have declined, and consequently ironmasters have decided not to carry out their intention, but to await events, and the present indications are that the existing quotations will remain in force at least for the current month. At the works business continues very active both for finished iron and steel. In the engineering trade a good demand is being experienced, and some firms have orders which will keep them engaged for a considerable time. One establishment has contracts for Natal and for several home railway companies which will occupy its attention for the greater part of the year. Textile machine makers and locomotive builders have good orders. At some works, not only in Leeds but in Lincolnshire, there has been a great rush both before and since Christmas to complete machinery on order for Germany, so that it might be admitted to that country before the new tariff came into operation. The mild winter has interfered much with the house coal trade in Yorkshire, but recently there has been more readiness to place orders, some of them covering deliveries for the next two months. For manufacturing fuel there is a brisk demand.

The Romopac System.—On Friday the Romopac Tramway Construction Company, Ltd., gave a very successful demonstration of their system of laying and taking up tramway rails as described in the last issue of *PAGE'S WEEKLY*. After an inspection of the apparatus the Press representatives present were hospitably entertained by the firm.

The Machine Tool Trade.—The Low Moor Company, Ltd., Bradford, are busy at the present time, chiefly on turning and boring mills, planing machines, and milling machines. They are also building a large marine boiler-shell drilling machine. Carter and Wright, of Halifax, are engaged upon a number of special machines, comprising automatic saw-sharpeners, cold-iron saws, with automatic saw-sharpener attached, and Anglo-American lathes. In the same town, S. H. Hamer is constructing an automatic wire-straightening and cutting machine to deal with wire from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. diameter, and all lengths up to 24 ft. H. Broadbent, Ltd., Sowerby Bridge, have a large 36 in. quadruple-gear crank-shaft lathe in course of erection with two centres and four rests. The bed is 4 ft. long by 5 ft. across the top. Messrs. A. Kinghorn and Co.,

Todmorden, J. Dickenson and Co., J. Spencer and Co., and Miley's Machine Tool Company, Ltd., are also well employed. G. Wilkinson and Sons are having their premises extended. J. Sunderland is busy with bevel and worm gearing. D. Mitchell and Co., Ltd., are building an electrically-driven 9 ft. radial drill for boiler-makers' use. Stephen Stell and Co., Ltd., are making a special feature of an improved 10½ in. centre high-speed lathe. Ward, Haggas, and Smith have in hand a variety of work, including large horizontal boring and vertical milling machines.

Students' Engineering and Metallurgical Society.

—The seventh ordinary meeting was held at Sheffield on the 6th inst., when a paper on "Liquid Fuel" was read by Mr. H. Porter, the chair being occupied by Mr. Husband, A.M.Inst.C.E. Mr. Porter opened with a short description of the various oils used, explaining their production, and enumerating the countries from which the principal oil fuels are obtained. The lecturer dealt with the principles underlying the application of oil, showing various forms of furnaces and boilers in which this fuel may be used, explaining the means for obtaining complete combustion, and also the economies effected by its use. Steam raising, both in marine and loco. work was then dealt with. Proceeding, he spoke of the application of oil fuel in metallurgical work, such as crucible furnaces, etc. The paper was illustrated by upwards of fifty large drawings.

Students' Dinner at Leeds.—The twelfth annual dinner of the Association of Yorkshire Students of the Institution of Civil Engineers was held on the 8th inst. at the Queen's Hotel, Leeds. Mr. J. Hartley Wickstead (president) was in the chair, and the gathering, which numbered about eighty, included Sir Alexander R. Binnie (president of the Institution), Sir Alexander B. W. Kennedy (vice-president), and Dr. J. H. T. Tudsbury

Canada we found at the present moment 175 American representatives giving direct information to the United States as to how she could send her goods into Canada, while England had not one single commercial and Governmental representative in Canada.

New Harbour Scheme for Whitby.—The members of the Whitby Urban Council have decided an important question by the adoption of an extensive harbour scheme. The scheme before the council, estimated to cost £75,000, is to extend the piers 500 ft. in length, with a minimum depth of 7 ft. at low water. This would greatly reduce the swell of sea in the harbour, and permit average size trawlers to enter practically at low water. The contemplated constructions would occupy about three years. The only burden upon the town, supposing nothing occurred through the carrying out of the works, would be £2,100, which would mean about 10d. in the £ per annum.

The Gainsborough Workmen's Commission. in a recent report, gives particulars of visits to Leipsic and Dresden. The Commission wish to lay stress on the fact that in their inquiries they have had nothing whatever to do with politics; and this is why their comrades at Gainsborough elected them without any pressure whatever from outside, but in a free and independent open meeting, quite regardless of their political sentiments. The members paid an interesting visit to Karl Krause's machine factory, and were told by a principal that he had seen no agent of British tool-makers at the place for twenty-nine years. The party saw a patent embossing press that this firm send to America, despite the 45 per cent. ad valorem duty. This machine is sent to England for a price that is less by the amount of this duty, because, as was said, "you in England are free importers."

Lancashire District.

MANCHESTER.

Our Consular Service Criticised.—The annual dinner of the Bradford and District Chamber of Trade was held on February 6th, at the Great Northern Victoria Hotel, Bradford. The chair was taken by Mr. C. E. Hanson, president of the Chamber. Alderman Priestley, M.P., in responding to the toast of the "Members of Parliament," proposed by Mr. R. W. Goldie, said he had always been in favour of a Minister of Commerce with Cabinet rank. The day had gone by when our consuls should be looked upon to assist travellers and give reports upon diplomacy. What was wanted was that men should be established in such positions through their own merit and through their particular knowledge of the trades in the countries in which they were established. In

The fluctuations in Cleveland iron warrants have had the effect of unsettling the Manchester iron market during the week, and less buying has been done. Users have an idea that pig-iron is likely to be cheaper all round. Such a result, however, is regarded in the best-informed quarters as extremely doubtful. So much pig-iron has gone into the public stores that there is very little in the hands of makers. Prices of manufactured iron and steel are well maintained with a rising tendency. There is no lack of orders at the engineering works of Manchester and other towns in the country; more cotton and weaving mills are projected, to say nothing

of the increased manufacture of textile machinery and metal requirements for foreign railways and public works. Such is the demand for steel that buyers are securing supplies from abroad. Within the last fortnight something like 50,000 billets have been landed at the Manchester Docks from America and the Continent of Europe. The coal trade is also improving.

Fire Engine.—A new motor fire engine has been making trial runs through the streets of Manchester during the last few days. It is to be shipped to Capetown for the service of the Metropolitan Fire Brigade there. The engine has been built by Messrs. John Morris and Sons, of Salford; and it is the first of the kind that has been turned out in the Manchester district.

Electricity in Coal Mines.—There was an animated discussion on Tuesday at the meeting of the Manchester Geological and Mining Society, presided over by Mr. Henry Bramall, as to the use of electricity in collieries. Mr. P. Barrett Coulston read a paper on the subject. He contended that electricity could safely, efficiently, and economically be used in all mining operations—lighting, hauling, and cutting. As to electric coal-cutters, he said their use resulted in an increased output per man employed, the more economic working of coal, better round coal, and reduced risk of life.

Idle Electrical Currents.—The Manchester section of the Institution of Electrical Engineers held a meeting at Manchester University on Tuesday evening, when Mr. M. B. Field read a paper on "Idle Currents."

Large Railway Orders for Northern Firms.

Extensive orders are being placed for additional locomotive and rolling stock equipment for the Indian State Railways. Messrs. Robert Stephenson and Co., Ltd., of Darlington, are engaged upon a second consignment of powerful six-wheeled coupled bogie express passenger engines for the Oudh and Rohilkund State Railway, for which system the Vulcan Foundry, Ltd., of Newton-le-Willows, Lancashire, have recently completed no fewer than fifty heavy freight engines. The last-named firm have also delivered twenty-six six-wheeled coupled goods engines to the Eastern Bengal State Railway. For operation over the metre gauge lines of the Indian State Railways the Leeds Forge Company, Ltd., have secured orders for 150 bogie covered goods wagons, fifty-two four-wheeled covered wagons, and fifty-one bogie carriages, whilst for the broad gauge lines of the Indian State Railways the Leeds Forge Company are to build forty-seven bogie carriages, nineteen four-wheeled vehicles, and ten four-wheeled brake-vans, in addition to fifteen bogie carriages and two four-wheeled luggage vans for the Assam-Bengal Railway.

At Barrow the hematite iron trade is fairly well employed.

There is a fairly strong demand for prompt deliveries of metal, and makers are well sold forward, and there is an indication of even a stronger demand for iron for Bessemer steel purposes. For some time past the demand has been mainly for iron for the purposes of mild steel. Makers' stocks are almost nil, as they have several heavy delivery engagements, and some of these are to merchants and speculators who will probably run large parcels into stock. Iron ore is strong at 15s. per ton net at mines for good ordinary sorts. Steelmakers are employing their rail mills on half-time, and their plate mills on full time. The steel foundries are busy, and chilled steel castings are in full request. Merchant steel is quiet. There is not much activity in ship-building, but engineers are very well employed.

Improvements to the River Dee.—It was announced on Monday at a meeting of the River Dee Conservancy Board at Chester that a scheme was being developed for improving the navigation of the Dee. It is proposed to remove some rocks in the river below Connah's Quay and give the water freer way. The board confirmed the committee's instructions to the acting conservator to report what might be done as to the raising of £50,000 for improvements to the Dee. A deputation to the Government with a view to obtaining funds is suggested.

It is stated that the Hamburg-American Line is contemplating making Liverpool a port of call during the coming spring, and establishing at this centre a permanent basis of operations.

The Midlands.

BIRMINGHAM.

The volume of trade is here well maintained, particularly on the heavy metal working branches. Manufacturers complain, however, that they do not receive a fair proportion of profit on their turnover owing to the heavy cost of production, due principally to the appreciation of crude and semi-crude materials. It is stated that expansion is being retarded in some directions because customers will not pay the price. Engineers are busy in practically all departments. There is a continuous call for electrical plant in connection with municipal and private enterprises. Makers and machine tools and subsidiary supplies are as a rule working overtime, the home demand being particularly brisk. There is a steady run on American automatics, and United States makers have so many orders on hand

that it is difficult to ensure deliveries as required. The bridge-building yards are actively employed. Practically all descriptions of constructive material continue in brisk request. Additional orders are reaching the rolling stock manufacturers on both home and foreign account, and this branch is assured of steady employment for a long time to come. The automobile and cycle factories are running at topmost pressure, and confidence is so strong now in the permanence of the expansion in these trades the productive capacity is being considerably increased. The brass trades are making headway, and manufacturers are paying a good deal of attention to supplementing their shop equipment. Some of the light metal-working industries are still some way short of prosperity, and there is a considerable proportion of unemployed hands, though fewer than in many industrial centres.

The movement for the establishment of a Brassworkers' School for Birmingham was advanced a stage on Monday when the Technical School Committee received a deputation from the Brassworkers' Association, and promised to present a favourable report to the City Council. The members of the trade are practically unanimous in favour of the school.

Messrs. W. and T. Avery, Ltd., of the Soho Foundry, Birmingham, have now under construction for the engineering section of the Birmingham University, a large machine for testing whole members of constructional work, such as complete girders, columns, roof principals, roofs and machinery. It is designed to test specimens for tension, compression, and transversely. The maximum capacity is 300 tons, the total length 70 ft., and the weight of the metal in the machine is about 85 tons. The strain is applied by an hydraulic cylinder and ram, and is arranged to test specimens in tension up to 25 ft., in compression up to 30 ft., and transversely up to 20 ft. long. The machine will be a great acquisition to the University. It is one of the largest testing machines that has ever been made, and it so arranged that an official can govern from one position the hydraulic power applying the strain and the recording steelyard.

Birmingham.—Members of the Birmingham Association of Mechanical Engineers, to the number of 160, met at the Grand Hotel on Saturday night, for their annual dinner, over which Sir Hallelwell Rogers presided. In proposing "The City of Birmingham," Mr. Neville Chamberlain remarked that their University would very soon be one of the best equipped in the country. Already it was drawing students from all parts of the world, including our ally Japan, and when China woke

up to a new sense of her responsibilities there would be a contingent of Chinese walking into the Birmingham compound. The chairman, who proposed the toast of "The Association," made sympathetic reference at the outset to the deaths of Mr. Alfred Morcom and Mr. W. H. Greenwood. Continuing, he congratulated the association on its satisfactory state, as shown by last year's balance sheet. At the same time the Association did not receive from the city the support it should. Sir Hallelwell then referred at some length to the important place the engineering profession held in Birmingham. He did not need to remind them of the many eminent engineers the city had numbered, and still numbered among its citizens. He was sure that the Mechanical Engineers' Association was doing much for the profession, and he strongly appealed to all those connected with engineering to support its efforts. There was no doubt the motor-car industry, which had come to this country to stay, presented much scope to the profession, and he was told that they intended soon to monopolise the whole construction of the car. He was glad to see that the great importance of the scientific training of engineers to enable them to hold their own against all competition was being recognised.

Birmingham University Engineering Society.—

The annual dinner of the Birmingham University Engineering Society was held at the Old Royal Hotel on Friday last. Professor F. W. Burstall presided, and those present included Professor R. S. Heath (vice-principal of the University), Professor Gisbert Kapp, Professor Dixon, Professor T. Turner, Messrs. Hummel, W. Woodhouse, V. R. Westcott, G. Shaw Scott, C. Alfred Smith, and H. Lea. Responding to the toast of "The University," Professor Heath remarked that in less than six years the University's expenditure approximated to £300,000. It had been invested, he said, amongst other directions, in putting up the building at Bournbrook. When that work was finished they would have a school of engineering as good as any in the world. Mr. G. Shaw Scott, who spoke on behalf of the Engineering Society, referred to the fact that during the past four years its membership had increased from 60 to 120.

In Staffordshire the engineering trade continues to make

headway, alike with respect to the home and shipping-trade. It is a long time since the constructive engineering yards, the railway material engineering works, the steam boiler works, and the general machinery and engineering establishments were so busy as they are at date. Not only are they unable to keep pace with current orders in the matter of deliveries, but contract books in many cases are crowded with

forward orders: Makers of wheels, tyres, axles, springs, and the like are busy. Of late the South African Colonies have been large buyers, while India and the Far Eastern markets, South America, and some other shipping markets are providing very good and valuable indents. In all cases it is especially remarked that early execution of contracts and urgent delivery is impressed by buyers. This evidences unmistakably how low consumers have allowed themselves to become in the matter of what may be termed, even in the engineering and machinery trades stock. The railway companies, alike home and export, needing bridges and roofs executed are among the most exacting of customers to-day in the matter of early deliveries. In the iron trade increased demand is showing itself. The local tone generally is satisfactory, and manufacturers are hopeful of further very considerable early booking to be done.

The Staffordshire Iron and Steel Institute.—On Saturday night at a meeting, Mr. J. Kent Smith delivered a lecture, illustrated by lantern views, on "The Application of Vanadium to Steel; Some Commercial Results."

National Iron Trade Association.—It is reported that negotiations are steadily progressing for the formation of a national iron trade association, to include the makers of North and South Staffordshire, East Worcestershire, Shropshire, South Yorkshire, and Lancashire. The object of the association will be to regulate and control the price of bar iron. The movement has originated with the Staffordshire ironmasters, and has spread to the other districts. Common bars and merchant sorts are especially aimed at. Whether South Wales will join is undecided. The association will start with a minimum basis of £7 10s.

London becoming Impossible for Manufacturers.

—High rates, expensive labour, and dear raw material are driving the industries which once were the glory of London to the North. In fact, the whole area south of a line drawn across the country from Bristol to Ipswich is rapidly becoming impossible to the manufacturer, through the excessive cost of these charges. The Wilkins Wire Rope Company, Ltd., of Wapping, has deserted London for Eastwood, in Notts. The Wilkins Company has been at Wapping for half a century. They are, it will be remembered, manufacturers of wire ropes. Ample provision has been made in the new quarters for expansion, and if the business grows, as its directors hope it will, another provincial district will be enriched industrially at the expense of London.

Staveley Coal and Iron Company.—At the forthcoming meeting of the Staveley Coal and Iron Company the directors will lay before the shareholders full particulars

respecting a proposal to erect additional blast furnaces and by-product coke-oven plant; also extensive colliery developments. Re-adjustment of existing share capital and an additional issue will be proposed.

West of England.

BRISTOL.

A further addition has been made to the extensive equipment of the new Electrical Engineering Laboratories at the Merchant Venturers' Technical College, Bristol, in the shape of an 8-pole, six-phase double alternator, giving an output of 6 kw. at 50 volts per phase, and a frequency of 93 per second. The stator of one-half is mounted on ball bearings, and provided with a lever for measuring the torque. The two halves may be coupled to run together, either as generator (driven by the college motors), or as a motor on the city mains, or one may act as a generator and the other as motor for a Hopkinson test. This new machine has been specially built by the Electrical Construction Company, of Wolverhampton, to the specification of Professor D. Robertson, the head of the department of electrical engineering in the college. The laboratories are now supplied with the means of producing every variety of electric current which is used for commercial purposes.

Bristol Association of Engineers.—A meeting of this association was held at the Imperial Hotel on Saturday last. The president (Mr. W. W. Squire) occupied the chair. Mr. Thomas Morgans, M.Inst.C.E., read some notes on "Rope versus Belt Driving." Questions of materials used for ropes and belts, and of adhesion by wedging action in grooves and frictional contact on cylindrical and cambered surfaces, were considered; also the splicing of ropes and various modes of jointing belts, initial and constant stretching, percentage of slipping on pulleys, pressure on shaft journals and their lubrication, superposed, side by side, and crossed belt driving; and taut and slack sides during transmission. Climatic influences upon corlage, leather, etc., together with comparative duration and cost of ropes and belts, and of grooved rope wheels and plain belt pulleys, were discussed, capital outlay, interest and amortisement being taken into account. Mr. Becker, of Cardiff, exhibited and explained an ingenious but simple capping for wire ropes used for hoisting and hauling purposes, and capable of being either applied to or removed from a rope within a period of ten minutes. Its efficiency and reliability were tested by Lloyd's testing machines, and it was stated that in all tests to destruction the rope ruptured without the cap exhibiting any sign of failure.

Wales.

SWANSEA.

The Steam Coal Trade position at Cardiff has not materially changed. The unsettled weather which has prevailed since the middle of the week has somewhat retarded the movements of mineral "road" steamers, with the result that stocks of coal are once more accumulating on the railway sidings, and for prompt business prices are easier. On paper, however, all the large collieries are well sold over the quarter, and as there is no falling off in the demand for coal required for distant shipment, the lull is generally regarded as temporary, and a recovery may be expected with the advent of more favourable climatic conditions. In the small coal department supplies appear to have slightly over-reached the demand, and on the week a drop of 11. to 61. per ton has been experienced. Monmouthshire coals are a steadier market than steams, and notwithstanding the improvement in supplies of free coal and a rather scant supply of ready "bottoms," sellers have been holding out for full market prices, which in the majority of cases have been maintained.

The house coal trade remains very steady as regards values, but owing to a scarcity of small coasting craft the demand for salubrious coal has appreciably slackened. No. 3 Rhondda large is still quoted firmly at 14s., while this quality is equally hard at 10s. There has been only a moderate demand for coal suitable for bunkering purposes, and consequently the No. 2 Rhondda market is easier to the extent of 3d. per ton. Patent fuel manufacturers are quoting best brands at 15s. per ton, including tax, while second are well held at 14s. 6d. The coke market is active and firm, and the pitwood trade is showing signs of recovery, latest prices indicating a rise on the week of 61. per ton. Closing prices: Best steam coal, 14s. to 14s. 3d.; best seconds, 13s. 3d. to 13s. 61.; second, 12s. 3d. to 13s.; drip, 12s. 6d. to 13s.; very best small, 8s. 6d.; best ordinaries, 8s. 6d.; seconds, 7s. 6d. to 8s.; and inferior sorts from 7s. 6d.; best Monmouthshire large, 13s. to 13s. 6d.; best ordinaries, 12s. 6d. to 13s.; seconds, 12s. to 12s. 6d.; best smalls, 8s. 3d. to 8s. 6d.; seconds, 7s. 6d. to 8s.; best households, 16s. to 16s. 3d.; best ordinaries, 13s. 6d. to 14s.; No. 3 Rhondda large, 14s., small, 10s.; No. 2 Rhondda large, 11s. 6d. to 11s. 6d., smalls, 7s. 6d. to 8s.; patent fuel, 14s. 6d. to 15s. (including tax). Special "sundry coke, 23s. to 24s.; good foundry, 18s. 6d. to 19s.; furnace, 16s. 6d. to 17s.; and pitwood, 18s. to 18s. 3d. per ton, ex ship. The demand for all descriptions of finished iron and steel is quiet, buyers apparently holding off in the hope of easier prices. Steel rail makers are, however, well booked ahead, and are consequently in a position to quote with considerable firmness. In the tinplate trade orders recently booked are not of sufficient magnitude to keep the mills going regularly. This has resulted in lower prices being accepted for tinplate required for early delivery, and for February a even March shipment sales have been made at 3d. per box less than the accepted market prices.

Wireless Telephony.—Mr. Thomas Gladwell, of Swansea, has been carrying on some interesting experiments in wireless telephony between Swansea and the Mumbles, where he has constructed a large wooden hut in a field, in which is installed the necessary electrical apparatus. Across two fields, over 300 yards away, is a similar hut. At a recent demonstration some tests were made with satisfactory results.

Steel Workers' Wages.—The adjourned joint meeting of steel-makers and representatives of the Steel

Smelters' Union was held last week at the Metropole Hotel, Swansea, to further consider claims made on behalf of teamsters, ladlemen, and their helpers, and to receive the decision of the employers with regard to the demand made by the man for a general advance of 10 per cent. in steel workers' wages. Mr. Eccles, High Sheriff of Glamorgan, presided. At the outset, Mr. Eccles remarked that with regard to the claim for an advance of 10 per cent, the employers had come to the conclusion that the claim was not justified. This statement evoked some fruitless discussion. At the conclusion of the meeting, Mr. Eccles stated to Press representatives that the men had not justified their claim for an advance of wages, and that it was now withdrawn. It is understood, however, that the executive committee of the Union will sit this week at Manchester, and their advice will be sought as to whether the men's claim is to be forced.

Pit Fire at Clydach Vale.—It is reported that the raging fire which had existed at Cambrian pit, Clydach Vale, Rhondda Valley, since the explosion on March 10th last year, has been completely extinguished. The following was the mode of working adopted:—After the surface of the strata had been cooled with water, headings were driven over the whole length of the affected area, and thousands of tons of sand were driven by water at great pressure through bore holes to fill up the cavities discovered *en route*. This proved very effective in extinguishing the fire. Although the work was extremely hazardous and dangerous, it is remarkable that not a single fatality occurred.

Galvanised Sheets.—The Board of Trade returns for January again exceed the previous record. The shipments aggregate 46,000 tons, valued at £581,000, compared with 35,000 tons, and £402,000 for January last year. Of the increased value of £178,000 a large part is due to the enhanced prices which since the formation of the National Association have risen over £2 a ton. Exports to the Argentine increased from £93,000 to £169,000, and to Australia from £61,000 to £86,000.

Pwllheli Harbour Works.—£24,000 has already been spent on the construction of the Pwllheli new harbour. Over 300 men are employed on the works.

Ireland.

BELFAST.

The Belfast Shipbuilding Dispute.—A serious situation has arisen in connection with the Belfast engineering trade, the engineers having been on strike for 140 days by members of the Amalgamated Society of Engineers for an advance of 1s. a week on their present wages, which average 30s. Several conferences have taken place between representatives of the masters and the men, but up to the present no arrangement has been effected. The notice expires to-morrow, and should a settlement not then be arrived at the engineers will come out on strike. This would practically mean the closing of the shipyards.

Colonial.

Shipbuilding Industry for Canada.—The Tariff Commission has been requested to consider the claims of the Canadian shipbuilding industry for a reduction of duties on shipbuilding materials. The Commission has been asked to consider the claims of the Canadian shipbuilding industry for a reduction of duties on shipbuilding materials. The Commission has been asked to consider the claims of the Canadian shipbuilding industry for a reduction of duties on shipbuilding materials.

America and Great Britain, and the extension of the bounties for four years beyond the date at which they expire under existing statutes. It was admitted that Canadian demand now exceeded the capacity of Canadian furnaces and billet mills, but it was urged that no new capital to meet the cost of additional equipment could be raised unless the Government guaranteed more protection and extension of bounties. The advocates of bounties for shipbuilding all agreed in urging \$6 a ton as the minimum Government aid that would suffice to build up the industry. Halifax interests pressed for an early decision as the Nova Scotia Government and the City Councils of Halifax and Dartmouth are pledged to give a British shipbuilding firm with whom they are negotiating \$300,000 bonus if the Dominion Government will guarantee a \$6 bounty.

American Steel Trust and Canadian Industries.—

A report is being persistently circulated in Montreal that the American Steel Trust is endeavouring to secure control of the Canadian iron-steel and wire companies. The method which is being pursued is said to be the secret purchase of the various enterprises by a number of individuals connected with the Trust with a view to a general amalgamation at a later period.

Reported Steel Amalgamation.—It is rumoured that negotiations are being conducted for amalgamating the Dominion Iron and Steel Company, the Consolidated Lake Superior Corporation, Nova Scotia Steel and Coal Company, and the Dominion Coal Company. The companies would have a capitalisation of £16,000,000.

Electric Power in South Africa.—Consul-General Washington, of Capetown, in a report to the Department of Commerce and Labour, Washington, has expressed his opinion that South Africa was on the eve of introducing vast changes in its industrial life. He thought that the transmission of electric power would be generated by the great rivers of the interior. The question of developing and transmitting electric power from the Victoria Falls was to be considered by a committee of experts. Two engineering specialists to the Victoria Company were inspecting water power installations in European countries with a view to their application to Rhodesia. He was of the opinion that America's supremacy in the electrical field should secure the orders for machinery and supplies that will be needed to develop this vast water power.

Continental.

BERLIN.

German Iron Trade.—The iron trade in Upper Silesia was very active throughout January, and all iron and steel works are more heavily sold than almost ever before. Offers for the second half of the year have so far been steadily refused. The export business to Japan, China and South America has been very large; Roumania is taking much; and Servia, Bulgaria, and Denmark have bought freely. The Roumanian orders are all urgent for delivery before March 1st, when the import duty to that country will be raised. The home trade could not well be more active in all branches, and deliveries are in many cases weeks in arrears. Prices are firm, at an advance of 5s. per ton for delivery up to June 30th. Girders and Y shapes are seasonably quiet, and the works are busy re-making their stocks to meet the large spring demand. Plate and sheet makers are very busy.

Pipes are also dearer, with heavy engagements for petroleum pipe lines in Roumania. Scrap iron is much wanted, and is scarce and advancing. The spelter output is sold up to April. Prices have in the main followed the London market. The total production of spelter in Upper Silesia amounted in 1905 to 139,941 tons, against 125,674 in 1904, an increase of 11.7 per cent., and the Polish smelters turned out 7,637 tons, against 10,607 in 1904.

Wireless Telegraphy.—A wireless telegraphic station whose radius of susceptibility will cover nearly the whole of Europe, is being erected by the German Government at Norddeich, in Frisia, which is the railway terminus of the Prussian system. Messages will be received and transmitted from Germany, Switzerland, France, Great Britain, Denmark, Sweden, Norway, Spain, and the Balkan Peninsula. The tower is to be built of steel, and will be 213 ft. in height. A thousand miles is assumed as the effective radius of its transmitted messages; but it is possible that with the improvement of instruments and with the increasing delicacy and sensitiveness of receivers the distances both for transmitted and received messages will be greatly increased.

Cargo River Steamers.—The Cologne Gazette announces the inauguration by the Hamburg America Line of a new service of river steamers to replace the barges and lighters which hitherto have plied between Hamburg and the Rhine. Two steamers have been built of 1,300 tons burden, with triple compound engines of 550 h.p., and with all the equipment which experience has shown to be necessary in this branch of the German carrying trade.

United States.

United States Steel Corporation.

The excellent condition of the iron and steel trades has been clearly shown during the week by the publication of the earnings of the United States Steel Corporation during the last quarter of the past year. The net earnings for the three months amounted to \$35,278,688, or \$13,819,434 more than during the corresponding quarter of 1904, bringing the total earnings for the year to \$119,850,282, compared with \$73,170,322 in 1904, \$80,000,271 in 1905, and \$113,005,000 in 1902. The unfilled orders on hand on December 31st last amounted to 7,605,086 tons, the largest total ever recorded. At the end of September they were 5,305,377 tons, and at the end of December, 1904, they were 4,696,203. That there are no immediate signs of any falling off in the demand for steel may be gathered from the one fact that, although structural mills and fabricating shops have already sold their capacity for periods varying from six to fifteen months, bids have been made upon 200,000 to 250,000 tons of structural shapes, and 100,000 to 150,000 tons more will be required for work projected during the first half of the present year.

Dewey Dry Dock's Voyage.—The Dewey Dry Dock should by this time have almost reached the Philippines. The towing fleet consists of the supply ship *Glacier*, flagship of the flotilla, the colliers *London* and *Canton*, and the ocean-going tug *Polmac*. After passing the Bermudas the flotilla took a more easterly course for Gibraltar, having taken the southern route across the Atlantic to avoid the wintry weather and storms of the more northern

route. By a constant system of changing coal, boat had a turn off to enable her to put into port for coal and then make upon the fleet again. By this system each boat also had a turn of leading the tow party.

Later.

It is reported that some anxiety exists as to the safety of the floating dry dock Dewey, which is not insured. The value of the dock is £250,000, and provisional arrangements were made some time ago to insure her, but the United States Government would not pay the premium of ten guineas per cent. Although she is equipped with wireless telegraphy and is travelling in the path of the regular steamship lines, she has not been reported since January 22nd. This immense dock weighs over 22,000 tons. She is very difficult to handle in a rough sea, and is towed at an average rate of only four miles an hour. The tow-rope is one and a half miles long. Vessels have been warned not to get foul of the tow-rope, but there are such things as fogs and storms, during which an accident may have happened.

Egypt.

The Esneh Barrage. The new Esneh Barrage will be constructed wholly by a British firm; Messrs. Sir John Aird and Co., the builders of the Assiout Dam, having been entrusted with the necessary fabric. The contract for the sluices, lock-gates, and swing bridge for the new Esneh Barrage has now been signed by the Egyptian Government, and Messrs. Ransomes and Rapier, Ltd. The object of the barrage, the building of which was definitely ratified by Ministers last month, is in a sense preservative. Its purpose is so to regulate and economise the distribution of the waters of the Nile as to secure the irrigation of the land in years of low flood. This function it will fulfil to some extent both above and below the

site on which the dam is to stand. There has hitherto been no barrage of any importance for the storage of water between Assouan and Assiout, and the Esneh Barrage may be reckoned in some degree as subsidiary to the great dam at Assouan, to which Esneh in nearer than to Assiout. The structure will, however, be built somewhat on the model of the Assiout Dam, save that it will have 120 sluice openings instead of the 111 at Assiout. It will, therefore, be a structure of rather greater magnitude than the northern barrage, which occupied about three and a half years to build, and this will doubtless be the period required for the work at Esneh. The cost of the undertaking will amount to one million—slightly more or less—and the Budget for the present year provides for a quarter of the total, namely £250,000, as expenditure on the preliminary works. Operations are to begin immediately the state of the river permits.

Bridging the Nile.—The Cleveland Bridge and Engineering Company, of Darlington, have been commissioned to take the borings across the Blue and the White Niles at Khartoum, with a view to ascertaining the nature of the strata and the most suitable types of railway bridges to construct at these points, where the Blue and the White Niles are each 1,200 ft. wide. As the boring operations have to be concluded before July next, when the Niles will be in full flood, a party of engineers are leaving for Khartoum on the 23rd inst. The expedition will be accompanied by Mr. W. E. Pease, of Mowden, Darlington—a director of the Cleveland Bridge and Engineering Company—and the boring operations will be under the charge of Mr. G. C. Imbault, of Darlington, the engineer who is in charge of the erection of the railway bridge over the river Zambezi at the Victoria Falls, which was only recently completed by the Cleveland Bridge and Engineering Company.

Latest Wills.

CUNARD, WILLIAM, aged 74, died at his residence in London of the Cunard Steamship Company, and until recently a director of the company, second son of Sir Samuel Cunard, Bart., the founder of the Cunard Line £224,914

GEORGE DAVID PAXON, aged 64, died at his residence, Avonside, Barford, Warwick, Professor of Engineering and Land Surveyor at the Royal Agricultural College, Cirencester, formerly Resident Engineer of the Clyde Trust Dock and Harbour Works, left £500 to his trustee, to distribute the income among indigent and helpless inhabitants of the town of Montrose, and £300 for other charitable purposes £85,856

JOHN BEEKEY ALMOND, aged 54, died at his residence, Sovereign Works, Stockport, and Windyhowe, Delamere, Chester, engineer and machine maker. Net personality

HENRY JOSEPH MORTON, J.P., aged 85, of 2, Westbourne Villas, Scarborough, formerly in business at Leeds in the oil trade, and in the manufacture of corrugated iron roofing, left about £29,000 for charitable purposes £29,000

RICHARD COLLIER, of 84, Holland Park, London, and Birchanger Lodge, Bishop's Stortford; a director of the Great Eastern Railway Company, King's Lynn Docks and Railway Company, and Milwall Docks Company

MR. THOMAS VOSPER, of Mossley Hill, Liverpool, and of Messrs. Vosper, Fernie, and Co., shipowners and ship-store merchants. Net personality £6,770

ALMOND, JOSEPH, aged 84, of Edenhurst, 157, Pembroke Road, Clifton, Bristol. He was formerly the Bristol manager of the Coalbrookdale Iron Company, and a regular attendant of the meetings of the Taft Vale Company

WENTWORTH-SHIELDS, FRANCIS WEBB, aged 85, M.I.C.E., of Brentwood Sholing, Southampton, resident engineer of the Crystal Palace during its construction; the designer of the Victoria Embankment on the Thames, for many years inspecting engineer to New South Wales Government, and the designer of the Australia

SMITH, JOSEPH, of Batley, machine maker

Contractors' News.

This list only contains contracts, particulars of which have not been previously published. For particulars of other contracts, see recent issues of "Page's Weekly," and small advertisements, pages 6 and 7. We shall be pleased to insert under this column, free of charge, particulars of open contracts.

Contracts Open.

United Kingdom.

| | Last Day. | | Last Day. |
|---|-----------|--|-----------|
| Berkshire. —Supply of three steam rollers, for the county council. Mr. J. F. Hawkins, county surveyor | Feb. 17 | Rathmines and Rathgar. —Coals, carbons and general stores for the electricity department | Feb. 17 |
| Wakefield. —Supply of water-softening and purification plant, for the corporation. Mr. H. A. Nevill, Calder Vale Road | Feb. 17 | Pontypridd. —Reservoir, condensing plant, cooling tower and tank, and artesian well for the urban district council | Mar. 3 |
| Beckenham. —Sinking of a borehole, for the urban district council. Mr. F. Stevens, clerk | Feb. 19 | West Hartlepool. —One 300-kw. high-speed engine and continuous current dynamo for the Corporation | Feb. 29 |
| Croydon. —Supply of fifteen double-deck double and single truck cars, respectively, complete, equipped with motors, etc., for the overhead trolley system. Electrical engineer (Mr. A. C. Cramb), Factory Lane, Croydon | Feb. 19 | Dundee. —Construction of three filter beds and clear water-well for the Water Commissioners. W. H. Blyth Martin, City Chambers | Feb. 22 |
| Battersea. —Supply of materials and stores for the Borough Electricity Department | Feb. 20 | Newton-in-Makerfield. —Annual supplies, including wrought-iron tubes, etc., for the Urban District Council stores. Stores clerk, Earlstown Gasworks | March 3 |
| Bermondsey. —Supply of various accessories for the electricity works. Borough electrical engineer | Feb. 22 | Horwich. —Sludge - pressing machinery and sewage purification works for the Urban District Council. H. L. Hinnell, 41, Corporation-street, Manchester | Feb. 27 |
| Islington (London). —Supply of stores, etc., including meters, carbons, incandescent lamps, terminal boxes, arc lamp globes, oils, engineer's stores, etc., for the Borough Council | Feb. 22 | Halifax. —Motor Tower Wagon. Borough Electrical Engineer, Foundry-street | Feb. 28 |
| Halifax. —Supply of stores and materials for the Corporation electricity tramways and highway departments, including electrical supplies, tools, ironmongery, engine-room stores, etc. | Feb. 29 | Pontcymmer, near Bridgend. —Construction of reservoir for the Garu Water Company. Togarmah Rees, Corn Exchange Chambers, Newport | Feb. 21 |
| Halifax. —A 30-35-h.p. motor tower wagon for the tramways department | Feb. 27 | Reading. —Supply of three steam rollers fitted with scarifiers, three road sleeping-vans, and three water-vans, to be delivered on or before April 2nd next, for the Berkshire County Council. County Surveyor's Office, Bank-chambers, Cross Street, Reading | Feb. 17 |
| Londonderry. —Supply of materials for the electricity department for one year from April 1st, 1906, including carbons, meters and demand indicators, bitumen and box compound, cables, boxes and troughs and house fuse boxes. The electrical engineer (Mr. R. V. Macrory), Strand Road, Londonderry | Mar. 3 | Warrington. —Supply of the following materials for twelve months from April 1st for the Water Committee; (Section No. 1) pipes, castings, valves, hydrant covers, etc.; (No. 2) bit, stop, and ball-cocks, terriers, etc.; (No. 3) oils. Water Engineer, Municipal Offices, Sankey Street | Feb. 24 |
| Shoreditch (London). —Tenders for stores for one year ending March 31st 1907, including electric cables and sundries, gas pipes and fittings, and engineers' stores. Town clerk, (Dr. H. Mansfield Robinson), Town Hall, Old Street, E.C. | Mar. 13 | Weston-super-Mare. —Tender for the steam heating apparatus at the Locking-road Central Schools, Weston-super-Mare, for the Education Committee of the Somerset County Council. Messrs. Price and Jane, Weston-super-Mare | Feb. 24 |
| Dublin. —The Commissioners of Public Works, Ireland, invite tenders for electrical works and supplies at buildings in Dublin and its vicinity. Mr. H. Williams, Office of Public Works, Dublin | Mar. 1 | Nottingham. —Supply of 1,000 Royal Ediswan 16-c.p. 200-volt electric lamps, each lamp to be marked "P.N." for the Guardians. Mr. G. Muncaster Howard, clerk | Feb. 9 |

| | Last Day. | | Last Day. |
|---|-----------|--|-----------|
| Stourton. —(1) For supply and erection of a cast-iron water tank, 10 ft. dia. by 12 ft. high; (2) supply and fixing of 70 ft. of 4 in. cast-iron flanged suction pipes, 50 ft. of 4 in. delivery pipes, with necessary bends, valves, and fittings. Mr. E. J. Silcock, M.Inst.C.E., Bank Road, Leeds | Feb. 19 | Pretoria (Transvaal). —Supply and erection of a refuse destructor, for the municipality. Messrs. Mosenthal, Sons and Co., 72, Basinghall Street, E.C. | Mar. 15 |
| Chatteris. —Water supply works for the Chatteris Urban District Council. The works include about 6½ miles of 7 in. cast-iron main pipes, and about 3½ miles of smaller mains and fittings; also a brick and slate meter-house and meters. Mr. Alfred Giddins, clerk | March 1 | Madrid. —Tenders are invited for 60,000 porcelain insulators No. 2, to be delivered in five lots—at Madrid, Barcelona, Cordoba, Valladolid, and Zargona | Mar. 11 |
| Glasgow. —Four double-power 52-ton movable hydraulic cranes and six hydraulic turn-over capstans for Prince's Dock, for the Trustees of the Clyde Navigation. Mr. Geo. H. Baxter mechanical engineer | Feb. 19 | Madrid. —The Direccion General de Obras Publicas invite tenders for an electric railway project in Barcelona | Mar. 11 |
| Exmouth. —Additional fire appliances for the Exmouth Urban District Council. Mr. Sami Hutton surveyor and engineer, Exmouth | Feb. 23 | Brisbane. —The Deputy Postmaster-General of the Commonwealth requires tenders for fifty telephone wall sets. General Post Offices of Sydney, Melbourne, Brisbane and Adelaide | Feb. 19 |
| Stone (Staffs.). —Installation of a hot water supply to the infirmary of their workhouse at Stone. Mr. J. Buckley Norris, clerk, 21, High Street, Stone | Feb. 19 | Shanghai. —Supply and delivery c.i.f. Shanghai, of the following plant: One 800-kw horizontal steam turbo-alternator (single-phase) with condensing plant. Messrs. Preece and Cardew, 8, Queen Anne's Gate, Westminster, S.W. | Feb. 22 |
| Dungarhill. —Embanking and concrete works required for enlarging water reservoir at Dungarhill. Mr. Albert E. Cox, Dungarhill, Dunkeld | Feb. 17 | Antwerp. —For the provision of heating apparatus for the New Flemish Lateral Hoofstede-Guarantee, 6,000 francs. Specification and plans to be had from the secretary, Town Hall. Antwerp | Mar. 2 |
| Bridlington. —Wiring of their premises for the New Spa Company, Bridlington. Manager, Spa and Gardens, Bridlington | Feb. 17 | Christiania. —Supply to the Norwegian State Railways of 260 truck tarpaulins and 1,900 metres of hemp cloth of various widths | Mar. 2 |
| Bristol. —Tenders for arc lamp carbons. Mr. H. Faraday Proctor, city electrical engineer | March 6 | Madrid. —The State Telegraph Department, invite tenders for the supply of 20 tons sulphate of copper | Mar. 4 |
| Abroad. | | | |
| Madrid. —Tenders for 55 tons galvanized wire, 3mm.; 15 tons bronze wire, 3mm.; 5 tons bronze wire, 2mm. Chief Telegraph Office, to Corretas, Madrid | Feb. 20 | Sydney. —Tenders for (a) boilers, automatic stokers, pipe work, etc.; (b) turbo-alternator, sub-station machinery, switchboards, etc. Mr. T. Rooke, at the offices of Messrs. Preece and Cardew, 8, Queen Anne's Gate, Westminster | May 7 |
| Brussels. —Supply of electrical accessories. Director of Roads, 11, Louvain, Brussels | Feb. 24 | Brussels. —Supply of fifteen turntables of 18½ metres in diameter for locomotives. M. de Rudder, Administrateur des Voies et Travaux, 11, Rue de Louvain, Brussels | Mar. 7 |
| Gothenburg (Sweden). —Supply of cast-iron pipes, for the municipal authorities. The Water Works Engineer, Water Works Office, | Feb. 22 | Rotterdam. —The Netherlands Colonial Office at The Hague require tenders for the supply of the following materials: Contract Lit L 12; 229,770 kilos of beam iron; 18,940 kilos of zores iron. Contract No. 413; 20,000 kilos of zincd steel wire, thickness 3.1 mm.; 70,000 kilos zincd steel wire, thickness 4.1 mm. Contract Lit M 12; 1,000 kilos of silicium bronze wire, thickness 1.5 mm. Commercial Intelligence Branch of the Board of Trade | Feb. 23 |
| Shanghai. —Supply of a 800-kilowatt horizontal steam turbo-alternator, with condensing plant, for the municipal council. Messrs. Preece and Cardew, 8, Queen Anne's Gate, Westminster, S.W. | Feb. 22 | Norway. —Supply to the Norwegian Telegraph Department of the following material: Three tons 1.25 mm. bronze wire; 500 metres 26-pair branch cable; 25,000 metres double tar wire, spun together; 200,000 metres double wire; 900 kilos sal-ammoniac; 2,700 kilos copper vitriol; 1,000 kilos gum arabic; battery zinc; and Morse paper. The Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C. | Feb. 21 |
| Paris. —The Municipality require offers for a concession of the electrical undertaking of Paris. M. de Pontich, director of works, Hotel de Ville, Paris | March 1 | | |
| Pilsen. —The Austrian State Railways invite tenders for the electric lighting of the station | March 6 | | |
| Sydney (New South Wales). —Supply and erection of a boiler, automatic stoker, pipe work, etc.; (b) turbo-alternator, sub-station machinery, switchboards, etc. Town | March 7 | | |

Last Day

Coming Contracts.

- Sweden.**—Tenders for 2,000 tons of best South Yorkshire hard steam coal. Manvers, Mitchell, Wombwell, Darfield, Hickleton, Staveley or Shirebrook, for the Norrköping-Söderköping-Vikholan Railway. Managing director of the railway, Count Nils Cronstedt, Norrköping
- Oporto.**—Steel plates for bridge construction. Direcção de Minho e Douro
- Denmark.**—The supply to the Østre and Valby gasworks of thirty railway trucks of normal gauge, each to carry ten tons of coal, in accordance with conditions which may be obtained from the office of the gasworks. Director of the Copenhagen Lighting Department, 22, Vestre Boulevard, Copenhagen
- Terralba (Italy).**—Municipal waterworks. Estimated cost, £7,700
- British India.**—The Secretary of State for India requires for the tenders supply (1) wheels and axles; (2) buffers for wagons; (3) bearings spring for wagons; (4) spiral and volute springs for wagons. Director-General of Stores, India Office, Whitehall, S.W.
- Lisbon.**—Construction of iron bridge (about £1,120). Direcção de Minho e Douro
- British India.**—The South Indian Railway Co., Ltd., are prepared to receive tenders for the supply of: (1) rolling stock—100 covered steel goods wagons, and five goods brake vans; (2) wheels and axles—210 pairs; and (3) laminated bearing springs—No. 420. The company's offices, 35, Gracechurch Street, London, E.C.
- Copenhagen.**—Thirty railway trucks of normal gauge, each to carry ten tons of coal, Manager, Østre and Valby Gasworks, 22, Vestre Boulevard, N. E.
- Rosario.**—Public electric lighting. Municipal authorities, Rosario, Argentine
- Brussels.**—Raising the dams of the Charleroi-Brussels Canal, at the estimated cost of 80,093.52 francs. Direction du Spécial Service des Canaux Houilliers, Rue de Lausanne, 4, St. Gilles
- Manila.**—Construction of two steel breakwaters. Harbour Works Manager
- Montevideo.**—Complete installation of Cerro de Montevideo lighthouse, of nine gaslit buoys, and of gas works. Ministerio de Fomento
- Talcahuano.**—Construction of floating steel dock of 1,000 tons displacement. Dirección del Material, Valparaíso
- Valparaíso.**—Harbour works, estimated cost, 33,149,760 pesos. Minister of Finance, Santiago
- Antwerp.**—Construction of a lock at Malines, estimated cost, £45,525. Rue des Augustins 15, Brussels
- Brussels.**—Works at Onoz, including three steam engines and pumps. Compagnie Internationale des Eaux de l'Agglomération Bruxelles, Rue du Trône 17
- West Bromwich.**—The Electricity Committee recommend the borrowing of £1,650 for additional machinery, mains and instruments.
- Reigate.**—The Council have received permission to borrow £4,000 for electric lighting extensions.
- Schaffhausen (Switzerland).**—Municipality are about to invite tenders for the improvement and extension of the town electricity works, and the provision of turbo-generating plant, at an estimated outlay of over £45,000.
- Tonbridge.**—A Local Government Board inquiry was held recently into the application of the Urban District Council for a loan of £12,000 for electrical lighting purposes. There was no objection.
- Lincoln.**—On the recommendation of the Electricity Works Committee, the Council have decided to apply for sanction to a loan of £13,000 for additions and extensions at the electricity works for cables, etc.
- Dundee.**—A proposal is before the Town Council to erect a new electric supply station. The site is situate on harbour ground at Stannergate.
- Greenock.**—The town council have agreed upon the erection of a refuse destructor to be worked in combination with the electricity department.
- Douglas.**—The council have decided to adopt electric traction on their present horse and cable tramways. An independent power station will be erected.
- America.**—The Navy Construction Board recommend that tenders should be invited for turbine machinery for the two new battleships to be laid down.
- Salford.**—The Water Committee propose to ask the Local Government Board for leave to borrow £6,000 to cover the cost of laying a water main from Prince's Bridge to Cross Lane.
- Stafford.**—It is proposed to extend the Corporation electric lighting business at a cost of about £6,300.
- Cardiff.**—The Ebbw Vale Steel, Iron and Coal Company, have decided to equip their Prince of Wales Colliery, at Abercarn with electrical plant for surface and underground purposes. Large extensions of the installation are contemplated in the near future, and eventually all the haulage gears, creepers, and pumps will be electrically driven.
- Pontnewydd.**—The Elled Colliery is about to instal electrical plant for pumping purposes, and in order to carry out a great distribution scheme and extend their system to the Carmarthen South Wales coalfield, the South Wales Power Co. propose to promote a bill in the next session of Parliament for powers to raise further capital to the extent of £1,000,000.
- Ludlow.**—A scheme for augmenting the supply of water to the East Hamlet district, at a cost of £1,850, has been adopted.
- Coldstream.**—The gas company have purchased a piece of ground, upon which a large gasholder is to be erected at a cost of nearly £1
- Liversedge.**—The urban district council are applying for sanction to purchase a steam roller.

Isle of Wight.—There is a project on foot for the extension of the water-supply works at a cost of £950.

Macclesfield.—The corporation having recently applied to the Local Government Board for sanction to borrow £16,000 for purposes of electric lighting and for approval to the appropriation of land as a site for a generating station.

Birkenhead.—The Electricity Committee have resolved to extend the Bentinck-street electricity works at a cost of £11,896. The additional plant will include a 350-kw. steam dynamo, two water-tube boilers, condensing plant, etc.

Menai Straits.—A scheme is on foot for the utilisation of water power to be obtained from the river Bariant, which falls 100 ft. into the Straits, in order to use this power to generate electrical energy for lighting purposes.

Roumania.—The Municipality of Giurgevo will shortly invite tenders for the installation of an electric lighting system in that town, at an estimated cost of 960,000 fr. (about £23,000).

Burnley.—The Corporation have received sanction to the borrowing of £20,000 for the purpose of extensions at the gas works.

Bodmin.—The town council have approved the plans and estimate of the cost of the proposed outfall works, and are making application for sanction to borrow £5,000 for the purpose of constructing the works.

Crewes.—The town at present receives its water supply from the London and North Western Railway, but the Corporation have now decided to expend £500 on trial borings with a view to establishing a municipal supply.

Dartmouth.—The council are about to purchase an up-to-date steam engine and modern fire-extinguishing apparatus.

Silsden.—The council are considering the necessity of purchasing a steam fire-engine.

Contracts Closed.

Egypt.—Messrs. Kamses and Raper Ltd. have received the contract from the Egyptian Government for the construction of the sluices of the Esneh Barrage, and for the lock gates and swing bridge. The sluices number 120, of new design. The contractors for the masonry of the barrage are Messrs. John Aird and Co.

Gorton.—Messrs. Beyer, Peacock and Co. have received orders for 20 powerful locomotives for the Central Railway Company's fast goods traffic, and also for 30 compound freight engines for the Buenos Ayres Great Southern Railway. 6 large locomotives for hauling goods trains on the Argentine Great Western Railway, and 6 engines for the Central Uruguay Railway.

London.—The Metropolitan Asylums Board have accepted the estimate of Messrs. Babcock and Wilcox for the provision of three multitubular boilers with setting and mechanical stokers at the South-Eastern Hospital, subject to the sanction of the Local Government Board. The estimate was £2,250.

Motherwell.—The Stirling Boiler Company have received an order for boiler plant, to have a total heating surface of 30,000 square feet, in connection with the extension at the Parkhead Forge Works of Messrs. Wm. Beardmore and Co.

Newport.—Messrs. W. A. Baker and Co., Ltd., have received an order for steelwork for the Admiralty's new torpedo depot at Devonport amounting to between £20,000 and £30,000.

Loughborough.—An order has been placed with the Brush Electrical Engineering Company for 40 steel trailer coaches for the Metropolitan District Railway. The cars are to be of similar design to those at present in service on this line, but steel is to be used instead of the non-inflammable timber of which the existing rolling stock is constructed.

Islington.—The tender of the British Thomson-Houston Co., at £255 10s. 2d., for six electric motors for the Caledonian Road baths has been accepted by the Council.

Glasgow.—The Corporation have ordered four boilers from the Stirling Boiler Company, Motherwell, N.B., and six boilers from Messrs. Babcock and Wilcox, London, E.C.

Croydon.—The Corporation have accepted the tender of Dick, Kerr and Co. for a 1,000-k.w. d.c. steam dynamo at £6,975, and that of Siemens Bros. and Co. for traction feeder panels at £10,800.

Birmingham.—The Tramways Department has placed an order for 75 "Aston-Worsley" weight-relieving arc lamp clutches, winches, etc., for the new carsheds, with Messrs. Verity, Ltd.

Taunton.—Messrs. Newtons, Ltd., have received instructions from Messrs. Foote and Milne, London, contract for the Newquay Electric Light and Power Company, Ltd., to supply the generators and boosters for the new generating station.

Reigate.—The Council have accepted the tender of the Aron Electricity Meter, Ltd., for the maintenance of meters.

Leyton.—Messrs. W. Manders' tender for construction of permanent way of tramways at £127,485 11s. 5d. has been accepted.

Tokio.—The Toyo Kisen Kaisha, Tokio, have placed an order on the North-East Coast for the construction of the turbine machinery for the two 10,000 tons steamers they are building at Nagasaki.

Newquay.—Messrs. Newtons, Ltd., Taunton, have received an order from Messrs. Foote and Milne, of London, the contractors for the Newquay Electric Light and Power Company, Ltd., for generators and boosters for the new central station.

Rotherham.—The Tramways Committee have accepted the tender of Messrs. Dick, Kerr and Co., Ltd., for the supply of six covered tops for tramcars of the Leicester type, at £2,000 each.

Southwark.—The borough council have placed an order with the General Electric Company for sixteen automatic switchboard breakers at £1,000 each.

Hammersmith.—The borough council have placed an order with Messrs. Babcock and Wilcox for a coal weighing apparatus to be installed at the electricity works at a cost, including two sets of overhead rails, weigh-hoppers, shoots, mouthpieces, etc., of £200.

Renfrew.—Messrs. Lohmiz and Co., Ltd., have received a repeat order for one of their patent plants for breaking rock under water without the use of explosives for the Manchester Ship Canal.

Leeds.—For the water gauge sections of the Indian State Railways, the Leeds-Lodge Company have secured orders for the provision of 550 bogie covered goods waggons, 50 four-wheeled covered goods wagons and 12 bogie carriages; and for the broad gauge lines they will construct 47 bogie carriages, 19 four-wheeled vehicles, and 10 four-wheeled brake vans. The firm recently delivered 40 large wagons, of a special design, for the Barsi Light Railway, and have also secured further contracts for 15 bogie carriages and two four-wheeled luggage vans for the Assam-Bengal Railway.

Manchester.—Among the contracts entered into by the Manchester Corporation at their recent meeting were the following:—British Electric Transformer Company, four single-phase transformers; British Westinghouse Company, high and low tension switchboards.

Loughborough.—County of Durham Electrical Power Distribution Company (per British Electric Traction Company, Ltd.), have placed an order for eight 500 kw. three-phase transformers with the Brush Electrical Engineering Company, Ltd.

Appointments Vacant.

Chester.—Superintendent to have the control and management of the new Corporation sewage disposal works, including steam engines, gas engines, producer gas plant, and the usual mechanical appliances common to a modern sewage disposal installation. Salary £150. Town Clerk

Feb. 24

Wigan.—The Urban District Council require the services of an engineer in the laying of their new water-mains and the works connected therewith. Mr. Joseph W. Crookes, clerk... Feb. 24

Appointments Filled.

Kensington.—Mr. A. R. Finch who has been in the service of the local authority for eighteen years, has been appointed borough engineer at a salary of £600, rising to £1,000 a year.

Bengal.—Mr. David Scott, superintendent of the Greenock Corporation Electricity Department, has been appointed electrical engineer and adviser to the Bengal Government.

Normanton.—Mr. E. E. A. Talbot has been appointed to succeed Mr. M. Weatherburn as the Midland Railway Company's locomotive superintendent for London and district; he will also take over the electrical work hitherto attached to another section of the locomotive department.

Runcorn.—The Education Committee have appointed Mr. B. Myer lecturer in electric lighting and power transmission at the Technical Institute.

Glasgow.—Mr. Robert Sinclair has been appointed to take charge of the rubber tyre and mechanical departments of the St. Helens Cable Co.'s branch at Glasgow.

Newcastle.—The directors of the North-Eastern Railway Company have appointed Mr. R. L. Wedgwood divisional goods manager for the Newcastle district.

Kensington.—The president of the Board of Education has appointed Professor Watts to be professor of physics at the Royal College of Science, South Kensington.

Forthcoming Exhibitions.

The Netherlands.—An exhibition is to be held at Leenwarden, in the province of Friesland, from the 6th July to 14th August next. The following are included in the scope of the exhibition. Machinery and implements of industry on a small scale; tools and implements not driven by machinery, and means of transport. Applications for space must be received before the 15th March.

Roumania.—A National Exhibition is to be held in Bucharest from 1st—14th June to 1st—14th December, 1906. Exhibits of the following kind are invited from foreign traders: Boring machinery, and all other kinds of articles required in the petroleum industry; all kinds of machinery for raising water; arms of every description; cutlery and garden implements.

London's Great Exhibition, 1907.—An industrial exhibition, called "London's Great Exhibition, 1907," is to be opened next year at Shepherd's Bush on a new exhibition ground, nearly 100 acres in extent, under the direction of Mr. Imre Kiralfy. The promoters state that the grounds will contain thirty acres of buildings, or considerably more space than was occupied by the whole of either the 1861 or 1862 Exhibition. In co-operation with Mr. Kiralfy is M. Toudoire, the architect who designed the Architectural Court of the Esplanade des Invalides of the Paris Exhibition of 1900.

Olympia.—It is proposed to hold an exhibition of Engineering and Machinery at Olympia from September 15th to October 17th next, under the presidency of Sir William H. White. The exhibits will be classified under the following sections, amongst others: Mining machinery and appliances; metallurgical processes, fuels and raw materials; workshop tools and appliances; gas, steam, and oil engines; transmission; lifting appliances and construction plant; hydraulic work; pneumatic work; grinding, crushing, and ore-dressing machinery; railway and tramway work; bridge, roof, and girder work; naval and marine engineering dockyard plant; road locomotion; electrical appliances, power and light, telegraph and telephone; textile machinery; agricultural machinery; military engineering; water-works engineering, etc., etc. The organising managers are: Messrs. G. D. Smith and F. W. Bridges, 119-125, Finsbury Pavement, London, E.C.

Weekly Synopsis of Company Meetings and News.

Measures Bros.

The accounts for the year last show that after providing for the dividend on the preference shares, a credit balance of £199 brought down was increased to £5,114, which it is proposed to carry forward. "A considerable improvement," it is stated, "took place during the last two months of the year; but it came too late to make a substantial increase in the profits. The present appearances all point to the conclusion that the improvement in trade is likely to last, and the directors hope that the passing of the dividend will be compensated for in 1906."

Western Wagon and Property.

The accounts to December 31st show an available balance of £16,585, which, with the £370 brought forward from last account, gives a total net revenue of £16,956. The following amounts have already been distributed: Interest on debentures and deposits for the year, £3,148; interim dividend for half-year paid in July last at the rate of 10 per cent. per annum (less income tax), £6,650; and it is proposed to appropriate the balance as follows: Dividend for half-year at the rate of 10 per cent. per annum (less income tax) on share capital, £6,650, and balance to be carried to the credit of next account. The report has been adopted.

Wigan Coal and Iron.

The report for the year ended December 31st last shows a net profit of £12,094, plus £1,000 brought forward from 1904. The directors recommend a final dividend of 2½ per cent. actual, making 4 per cent. for the full year, carrying forward £12,094. Although the output and sales were about the same as in the preceding year, the selling prices have fallen, but wages are unaltered. An improvement in prices and a demand for iron and steel set in at the latter end of the past year.

Docker Brothers.

The annual meeting of this company was held at the Queen's Hotel, Birmingham, February 9th, under the presidency of Mr. J. P. Lacy. There was a disposable balance of £1,174, and dividends were paid at the

10 per cent. for the year, and a bonus of 5s. per share and the directors were able to carry forward £17,573. The chairman said they had had a most satisfactory year, with large increases in sales and a proportionate increase in the profits.

Mather and Platt, Ltd.—The directors have declared an interim dividend on the ordinary shares at the rate of 6 per cent. per annum, free of income-tax, for the half-year ended December 31st.

Leeds Copper Works Company.

The accounts of this company for the year 1905 show a trading profit of £15,148, against £7,594 in 1904. The general administration and interest charges (less rents) amounted to £14,406, against £15,432, the final result being a net profit of £742, as against a loss of £7,838 in 1904. This great improvement has been made chiefly during the last six months of the year, and in the face of severe competition. The adverse balance is now £26,362. The directors report that during the last few months certain economies have been effected which will substantially reduce the general charges of the current year. The business has materially increased in volume. Mons. Silvain, Mr. Wenham, Col. Paget Mosley, and Mr. C. W. Keighley have retired from the directorate, and Mr. Wm. Hy. Armitage, of Huddersfield, and Mr. Stany Oppenheim, of Paris, have accepted seats. M. Daniel Bethmont (director) and Messrs. Jarvis Barber and Sons (auditors) offer themselves for re-election.

Bristol and South Wales Wagon.

The annual meeting of this company was held at Bristol on the 8th inst., under the presidency of Colonel Savile. The report showed a disposable balance of £16,599, and the directors recommended a final dividend of 10 per cent. on the ordinary shares, and a bonus of 5s. per share.

Telegraph Construction and Maintenance.

The directors have recommended a final dividend of 10 per cent. on the ordinary shares, and a bonus of 5s. per share, and have also recommended a final dividend of 10 per cent. on the preference shares.

New Companies Registered.

In the following list the registered addresses of New Companies are given whenever possible. As, however, this information may be legally withheld until the actual date of commencing business, addresses are not always obtainable.

Alexander Young (London), Ltd.

Registered January 24th. Capital £100,000 in £1 shares. Object, to carry on the business carried on at 8, Leadenhall Street, E.C., 50, Wellington Street, Glasgow, and elsewhere, as Alexander Young and Co., and to carry on the business of merchants, bankers, traders, agents, shipowners and shipbuilders, engineers, boiler makers, charterers of ships and vessels, warehousemen, ship and insurance brokers, carriers, forwarding agents, wharfingers, etc. No initial public issue. A. Young may act as sole manager for life. Registered office: 8, Leadenhall Street, E.C.

Tweedales and Smalley, Ltd.

Registered January 1st. Capital £250,000 in £1 shares. Object, to take over as a going concern the business carried on at Castleton, near Manchester, by E. Tweedale, S. Tweedale, and J. Smalley, under the style of Tweedales and Smalley, and to carry on the business of cotton machinery makers, machinists,

ironmasters, founders, general engineers, agricultural implement manufacturers, copper-smiths, electricians, suppliers of electricity for all purposes, builders of electric cars, tramcars, and other vehicles and rolling stock, etc. No initial public issue. E. Tweedale, S. Tweedale and J. Smalley are permanent governing directors, subject in each case to holding £10,000 shares. Remuneration: £1,000 each per annum. Registered office: Castleton, Lancashire.

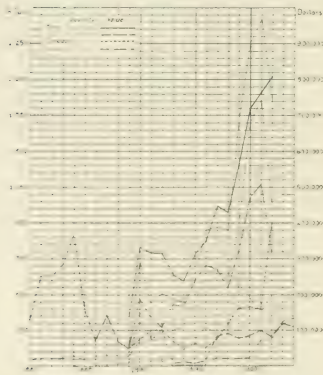
Edwin Price and Co., Ltd.

Registered January 29th. Capital £10,000 in £50 shares. Object, to acquire a freehold foundry and engineering works, with fixed plant, machinery, fixtures, and railways thereon, at Neath, Glamorganshire, and the business of mechanical engineers, iron and brass founders, etc., carried on there by Price's Engineering Company, Limited, and to adopt an agreement with R. G. Cawker. No initial public issue.

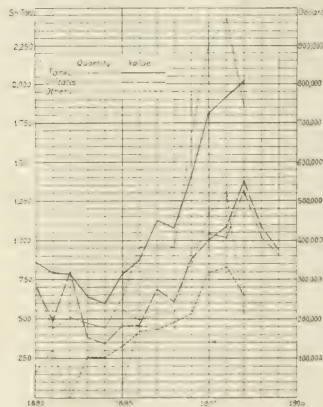
Zircon Syndicate, Ltd.—Registered February 1st.

Capital, £2,000, in £1 shares (sub-division not shown). Object, to deal in, manufacture, sell, exploit, distribute and supply incandescent and electric lamps of all kinds, etc., and to adopt an agreement with the International Dowsing Electric Heating and Appliances Company, Ltd. No initial public issue. Registered office: 24, Bridge Row, E.C.

World's Production and Consumption of Mica.



WORLD'S PRODUCTION OF SHEET MICA.



WORLD'S CONSUMPTION OF SHEET MICA.

Electrical Manufacturing Companies.

| Present Amount Subscribed | Share. | Last Dividend. | Name | Paid up. | Closing Prices. |
|---------------------------|--------|----------------|--|----------|-----------------|
| 70,000 | 1 | 6d. | Alliance Elec. Co. Ltd. 5% Cum. Pr. | 1 | 78 - 84 |
| 120,000 | 1 | 7d. | Aron Electric Mer. Ltd. 5% Cum. Pr. | 1 | 74 - 78 |
| 120,000 | 1 | 17/32 | Beith's Asbestos Co., Ltd. | 1 | 1 1/2 - 1 1/8 |
| 100,000 | 5 | 1/4 | British Aluminium Co. 7 1/2 Cum. Pref. | 5 | 54 - 6 |
| £300,000 | 80k | 5% | Do. 4% 1st Mort. Deb. Stk. Rd. | 100 | 95 - 102 |
| 100,000 | 4 | 4r | British Insulated & Helsby Cables Ltd., Ord. | 5 | 6 1/2 - 7 |
| 100,000 | 5 | 3/4 | Do. 4% Cum. Pref. | 5 | 104 - 105 |
| £200,000 | 80k | 4% | Do. 4% 1st Mort. Deb. Stk. Rd. | 100 | 103 - 105 |
| £200,000 | 80k | 4 1/2% | British Thomson-Houston Co., Ltd. | 100 | 95 - 100 |
| 400,000 | 5 | 5/4 | Do. 4% 1st Mort. Deb. Stk. Rd. | 100 | 95 - 100 |
| £616,938 | 80k | 4% | British Westinghouse Electric and Manuf. Co. Ltd. 5% Pref. | 5 | 112 - 114 |
| 106,751 | 2 | 3/4 | Do. 4% Mort. Deb. Stk. Rd. | 100 | 77 - 82 |
| 100,000 | 2 | 2 1/4 | Brush Elec. Engng. Co. Ltd., Ord. | 2 | 8 - 8 1/2 |
| £125,000 | 80k | 4 1/2% | Do. 6% Pref. | 1 | 112 - 122 |
| £125,000 | 80k | 4 1/2% | Do. 4% Perp. 1st Deb. Stk. | 100 | 99 - 101 |
| 35,000 | 5 | 5/4 | Do. 4% Perp. 2nd Deb. Stk. | 100 | 82 - 84 |
| 100,000 | 5 | 5/4 | Callender's Cable & Condn. Ltd. Ord. | 11 | 11 - 12 |
| £200,000 | 80k | 4 1/2% | Do. 4% Cum. Pref. | 5 | 108 - 110 |
| 85,000 | 3 | 1/6 | Do. 4% 1st Mort. Deb. Stk. Rd. | 100 | 108 1/2 - 110 |
| £100,000 | 5 | 1/2 | Crompton & Co., Ltd. | 3 | 2 - 2 1/4 |
| 52,000 | 5 | 10/1 | Do. 5% Mort. Reg. Deb. | 100 | 108 - 109 1/2 |
| 61,000 | 5 | 3/4 | Dick, Kerr & Co. Ltd., Ord. | 5 | 8 1/2 - 9 |
| £200,000 | 80k | 4 1/2% | Do. 6% Cum. Pref. | 5 | 6 1/2 - 7 |
| £253,334 | 80k | 4 1/2% | Do. 4% Deb. Stock, Rd. | 100 | 104 - 106 |
| £233,334 | 80k | 4 1/2% | Do. 4% 1st Mort. Deb. Stk. Rd. | 100 | 104 - 106 |
| 99,261 | 5 | 1/6 | Do. 4% 1st Mort. Deb. Stk. Rd. | 100 | 100 - 105 |
| 17,139 | 5 | 2/6 | Edison and Swan United Electric Light, Ltd., "A" Shares | 3 | 14 - 13 |
| £244,023 | 80k | 4% | Do. "A" Shares No. 01,017,139 | 5 | 25 - 28 |
| 120,000 | 5 | 4% | Do. 4% Deb. Stock, Rd. | 100 | 92 - 102 |
| 112,100 | 2 | 1 1/2 | Do. 5% Second Deb. Stk. Rd. | 100 | 102 - 97 |
| 31,390 | 2 | 2 3/4 | Electric Construction Co. Ltd. | 2 | 8 - 9 |
| £200,000 | 80k | 4% | Do. 7% Cumulative Pref. | 2 | 2 - 2 1/4 |
| 10,248 | 10 | 7/8 | Do. 4% Perp. 1st Mt. Deb. Stk. | 100 | 90 - 92 |
| 25,000 | 10 | 5/4 | Evered and Co. Ltd. | 10 | 9 - 11 |
| £200,000 | 80k | 4% | Gen. Elect. Co. (1900), Ltd. 5% Cum. Pref. | 10 | 95 - 9 |
| 35,000 | 5 | 5/4 | Do. 4% 1st Mt. Deb. Stk. Rd. | 100 | 98 - 102 |
| 85,000 | 5 | 2/3 | Henley's (W. T.) Telegraph Works Co., Ltd., Ord. | 5 | 13 - 14 |
| £25,000 | 5 | 4% | Do. 4% Cum. Pref. | 5 | 54 - 55 |
| 50,000 | 10 | 15/16 | India Rubber, Gutta Percha & Telegraph Works Co., Ltd. | 100 | 18 - 19 |
| £300,000 | 100 | 4% | Do. 1st Mort. Deb. Rd. | 100 | 98 - 102 |
| 100,000 | 1 | 3% | Scott's (Wm.) & Son, Ltd. Ord. | 1 | 11 1/3 - 17 1/2 |
| 37,750 | 12 | 12/1 | Telegraph Construction and Maintenance Co., Ltd. | 12 | 314 - 361 |
| 150,000 | 100 | 4% | Do. 4% Deb. Bonds | 100 | 2100 - 100 |
| 150,000 | 1 | 1 1/2 | United Electric & Light Ord. | 1 | 4 1/2 - 2 1/2 |
| £50,000 | 80k | 5% | Do. 5% 1st Mort. Deb. Rd. | 100 | 103 - 101 |

Railway Carriage and Wagon Companies.

| Present Amount Subscribed | Shares | Last Paid dividend | Name | Paid up | Closing Prices. |
|---------------------------|--------|--------------------|---|---------|-----------------|
| 10,000 | 10 | 7 7/8 | Burn. Railway-Car. & Wagon, L. | 10 | 36 - 38 |
| | | | " " " " " " " " | | 1-10,000 |
| 8,739 | 10 | 3/4 | Do. Second Issue 1-8,739-- | 4 | 10-10 1/2 |
| 10,000 | 10 | 6 1/2 | Do. Cum. Pref. 6% 1-10,000- | 10 | 131-14 1/2 |
| 50,000 | 10 | 10 | Bristol & South Wales Railway's Wagon, Nos. 1--80,000 | 3 | 52 - 62 |
| -0,000 | 20 | 8 | Bristol Wagon & Carriage Works | 10 | 14 1/2 - 15 |
| | | | " " " " " " " " | | 1-1,000 |
| 5,000 | 20 | 8 | Do. 1875, Nos. 8,001-18,000 | 2 | 3 - 3 1/2 |
| 2,000 | 20 | 8 | Do. 5 1/2% Participating Pref. | 10 | 142-143 |
| | | | Nos. 81--82,000 | 10 | 142-143 |
| 30,111 | 7 | 7 1/8 | Gloucester Rail.-Car. & Wagon Co. | 7 | 102-103 |
| | | | A 129,851 A 19,751 50,000 | | |
| 44,889 | 7 | 3 3/8 | Do. B. 21,862-19,750, 50,001-75,000 | 7 | 45 - 4 |
| 10,000 | 10 | 6 1/2 | Lancashire and Yorkshire Wagon. | 12 | 12-13 |
| 14,267 | 10 | 1 1/2 | London & North Western Wagon, Ord. | 2 | 24 - 25 |
| 4,150 | 10 | 5 1/2 | Do. do. | 10 | 102-103 |
| 74,908 | 1 | 9 3/4 | Metropolitan Amalgamated Rail.-Carriage & Wagon Co., Ltd. | 1 | 44 1/2-45 1/2 |
| 164,288 | 1 | 63d. | Do. Cum. & Pref. 5 1/2%, 1,161,288 | 1 | 33 1/2-34 |
| 235,000 | 1 | 7 1/2d. | Do. Cum. & Pref. 6%, 2,235,000 | 1 | 27 1/2-28 1/2 |
| 20,000 | 20 | 20/- | Midland Rail.-Car. & Wagon, Ltd. | 10 | 20 1/2-21 1/2 |
| | | | " " " " " " " " | | 1-20,000 |
| 10,000 | 6 | 10 | Western Wagon and Property | 10 | 121-122 |
| | | | Nos. 1--10,000 | | |
| 40,000 | 6 | 10 | Do. " " " " " " " " | 2 | 12-14 1/2 |

Stocks and bonds marked * are quoted ex-dividend.

Prices Current of Coal, Iron, Steel, and Other Metals.

Manufacturers' and Merchants' Quotations.

**News of the Week in
Brief.** *Wednesday,
February 14th, 1906.*

Wednesday,
February 14th, 1906.

THE Pig Iron Market has been in a sensitive condition during the past week, and on heavy sales the price of Cleveland at one time declined 2s. The weakness was brought about by a report from America that 3,000 tons of Alabama iron had been sold to Germany and Scotland. There was a rally at the close of the week, but the improvement has not been since maintained, the market developing fresh weakness on renewed liquidating sales so that Cleveland came down to 49s. 5d. the lowest level recently touched. Both Scotch and Hematite are sympathetically lower.

The **Copper Market** shows a firm undertone although dealings are somewhat restricted. At one time prices declined to £74 10s. for three months metal, but at this quotation buying orders were in evidence, and a rapid recovery ensued. Indeed, when the bear brigade came into the market to make covering purchases, they had some difficulty in doing so except by paying somewhat heavy premiums. The quotation has now recovered to £78, and there is no reason to expect any serious decline in quotations. As we have pointed out in previous issues available stocks are now dangerously low, and but little copper is going into warehouse.







The **Tin Market** has, like other sections, been the medium of heavy sales during the past week, speculators being influenced by the decline in copper, and the threatened coal strike in the States. Some bear selling was also indulged in, and prices at one time ran down to £102 17s. 6d. for three months' metal. A better tone has since been established owing to the limited quantities of prompt actually obtainable, and nearly all the loss has been recovered, the closing prices being £103 10s. 6d. and £105 1s. 4d. at three months.

Lead on offerings of forward metal had a slight decline, and **Zinc** had to be accepted for several lots of forward metal. At the lower level, however, consumers came in again, and the price has recovered to 100¢. **Spelter** is fairly steady on a good demand from consumers and a large business is looked for in the future. The closing price is 92¢. **Coal** **Trade** is displaying a good deal of vitality at the moment, the only exception to the general good being the anthracite market.

Iron, Steel, Pig-Iron, etc.

SCOTLAND

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B., quote as follows. Price delivered in Glasgow or export.

| Steel: | | £ | s | d |
|---|--|---|----|---|
|  | Siemens Steel Plates, Machine Boiler Quality | 8 | 12 | |
|  | " " " " Land " " | 8 | 12 | |
|  | " " Steel Bars, Boiler Quality | 8 | 10 | |
|  | Siemens Steel Plates, Ship Quality Plates | 7 | 7 | |
|  | " " " " Bars " " | 8 | 0 | |
|  | " " " " Angles " " | 7 | 0 | |

Manufactured Iron:

| Bars | Detail | W | H | W | H |
|------|--------------|---|----|---|----|
| .. | Best | 7 | 12 | 7 | 12 |
| .. | .. Horseshoe | 7 | 12 | 7 | 12 |
| .. | Angle | 7 | 12 | 7 | 12 |
| .. | Best Angle | 7 | 12 | 7 | 12 |
| .. | Best Best | 8 | 12 | 8 | 12 |
| .. | Extra Best | 8 | 12 | 8 | 12 |

Usual terms and extras. Special rates for delivery in England and export. The above prices subject to alteration without notice.

Malleable Common Bars:

| Material | Weight | Percentage |
|----------------------|--------|------------|
| Delux (not for sale) | 7.7 | 0.00 |
| Delux | 0.00 | 0.00 |
| North British | 0.00 | 0.00 |
| Drumhead | 6.7 | 0.00 |
| Woolley | 6.7 | 0.00 |
| Crown | 0.0 | 0.00 |
| Bandana | 0.0 | 0.00 |
| Minark | 0.0 | 0.00 |
| Reedhead | 0.0 | 0.00 |
| Phenix | 0.0 | 0.00 |
| Carbide | 2.0 | 0.00 |
| Coast | 0.00 | 0.00 |
| Angle Iron | | 0.00 |
| Steel Plates (imp) | | 0.00 |
| Barber Plates | | 0.00 |
| Cast | | 0.00 |
| Ally | | 0.00 |

John Spencer (Coatbridge) Ltd., Phoenix Ironworks
Coatbridge, N.B.

[illegible]

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE

Messrs. R. Feldtmann and Co., of Glasgow, quote on commission extra!:-

Pig Iron:

| | No. 1. | No. 2. |
|-------------------------------|-----------|-----------|
| Address, Glasgow | £ 8. 0. 0 | £ 8. 0. 0 |
| Carlisle | 16. 0 | 16. 0 |
| Carlisle | 18. 6 | 18. 6 |
| Swancliffe | 10. 0 | 10. 0 |
| Cambree | 5. 6 | 5. 6 |
| Langloan | 19. 0 | 19. 0 |
| Clyde | 16. 6 | 16. 6 |
| Clyde | 8. 0 | 8. 0 |
| Changarnock, Leith, Ardrossan | 18. 0 | 18. 0 |
| Edinburgh | 16. 6 | 16. 6 |
| Edinburgh | 16. 0 | 16. 0 |
| Edinburgh | 16. 6 | 16. 6 |

NORTH OF ENGLAND.

Messrs. W. Whitwell and Co. Ltd., Thornaby Ironworks, Stockton, quotes as follows, at works:-

| | £ s. d. |
|----------------------------------|-----------------|
| W.W. ⚔ Bars | 7 10 0 |
| W.W. Best Bars | 7 12 6 |
| W.W. Best Best | 8 5 0 |
| W.W. Best Best Best | 8 12 0 |
| W.W. Best Sheet | 8 0 0 |
| Thornaby ⚔ | 9 0 0 |
| Thornaby Best | 9 10 0 |
| Thornaby Best Best | 10 10 0 |
| Whitwell Special Admiralty Cable | 11 0 0 |
| Special Chain Iron | 10 0 0 |
| Tube and Nail Strip Iron | net cash 7 10 0 |
| W.W. ⚔ Angle Iron | 7 12 6 |
| W.W. Best Angle Iron | 8 0 0 |
| Free Iron, 10 inches United | 8 10 0 |

Terms, Cash, less 2½ per cent. discount on 10th of month following delivery.

LANCASHIRE.

The Pearson and Knowles Coal and Iron Company, Ltd., Dallam and Bewsey Forges, Warrington, quote as follows:-

| | Iron. | Steel. |
|----------|---------|---------|
| | £ s. d. | £ s. d. |
| ⚔ Bars | 7 15 | 8 0 0 |
| ⚔ Angles | 8 5 | 8 10 0 |
| ⚔ Tees | 8 15 | 9 0 0 |
| ⚔ Hoops | 8 0 | 8 0 0 |
| ⚔ Sheets | 9 0 | 9 10 0 |

Ordinary Sizes, F.A.S. Liverpool in 10-ton Lots.

Extras for Sizes and Cutting as per List.

Lots under 10 cwt. of a size 10s. per ton extra.

WORCESTERSHIRE.

Baldwins, Ltd. (with which is amalgamated Knight and Crowthorpe, Ltd.), Wilden Works, near Stourport, quote:-

| | Singles. | Double. |
|--------------------|------------|------------|
| | 24 G. 30m. | 24 G. 30m. |
| | per ton. | per ton. |
| Black Sheets | £ s. d. | £ s. d. |
| Angle | 11 0 0 | 12 0 0 |
| Sheet | 11 10 0 | 12 10 0 |
| Section | 12 10 0 | 13 10 0 |
| Profiled Wires, R. | 12 10 0 | 14 10 0 |
| Wire | 17 10 0 | 18 10 0 |
| R. Channel | 19 10 0 | 20 10 0 |

R. Channel and other and channel sheet specially quoted for.

Extra widths, Singles to 6in. Double to 50in. Lattens to 40in. Extra widths, Singles to 6in. Double to 50in. Lattens to 40in.

Patent Coated Sheets:

| | £ s. d. | £ s. d. |
|----------|---------|---------|
| No. 100 | 11 10 0 | 12 10 0 |
| S.A. 100 | 12 10 0 | 13 10 0 |
| No. 100 | 16 0 0 | 17 0 0 |
| S.A. 100 | 16 10 0 | 18 10 0 |

| | Singles. | Double. |
|--------------------|------------|------------|
| | 24 G. 30m. | 24 G. 30m. |
| | per ton. | per ton. |
| Tinned Sheets: | £ s. d. | £ s. d. |
| Best Coke (Finish) | 30 0 0 | 31 10 0 |
| Charcoal (Finish) | 32 0 0 | 33 10 0 |
| Extra | 33 0 0 | 34 0 0 |

Cotton Can Tin Sheets to 26in. by 36in. specially quoted for.
Tin Plates, "Cookley, R." Best Charcoal, 41 5s. 6d. per box.
Extreme sizes in Tin and Patent Coated specially quoted for.
Lattens up to 36 wide by 17 W.G. 41 10s. 6d. per ton extra throughout for all brands.
At works.

| | £ s. d. |
|--|--------------|
| Galvanized Corrugated Sheets: | £ s. d. |
| "Phoenix" Brand, 24 G., each London, in Bundles | 7 6 per ton. |
| "Blackwall" Brand, 26 G., in 10 ft. lined cases for Australia, each London | 6 5 0 |
| Galvanized Working Up-Sheets: | £ s. d. |
| 24 G., each London, in Bundles | 7 6 per ton. |

STAFFORDSHIRE.

Shelton Iron, Steel, and Coal Company, Ltd., Stoke on Trent, North Staffordshire, and 122, Cannon Street, London, quote:-

| | £ s. d. |
|--|-----------------|
| Crack Bars | 7 10 0 per ton. |
| Best Bars (1 to 6in. wide, above 2in. thick, 3 to 4in. rounds and squares) | 8 0 0 |
| Angles | 7 15 0 |
| Tees | 8 5 0 |
| Best | 8 10 0 |
| Best Sheet Iron | 8 0 0 |
| Rivet Iron | 8 0 0 |
| Best Rivet (Special) | 10 5 0 |
| Cable | 10 5 0 |
| Screwing | 10 5 0 |
| Best Turning | 10 5 0 |
| Plating | 10 5 0 |
| Best | 10 5 0 |
| Trickle Best | 10 5 0 |
| Plates | 10 5 0 |
| Best Plates | 10 5 0 |
| Best Boiler Plates | 10 5 0 |
| Trickle Best Boiler Plates | 10 5 0 |

Delivery f.o.b. Liverpool, Bokenhead or Manchester.

WALES.

Cordes (Dos Works), Ltd., of Newport, Mon., quote "Star" brand patent mild nails, steel nails, &c.

Discounts:

13 per cent. off 1-inch to 2-inch strong rods and all iron, second and 4th, and 5th pound.

25 per cent. off 2½-inch to 7-inch strong rods and 10lb. and 20lb. pound.

25 per cent. off all sharp-pointed nails.

Delivered in house of 4 cwt. and upwards. Extra 2½ per cent. discount off the gross on two tons and upwards.

Steel rods, flat points, 1-inch to 2-inch diam.

1-ton 10 cwt. 1-ton 10 cwt. 1-ton 10 cwt.

1-ton 10 cwt. 1-ton 10 cwt. 1-ton 10 cwt.

1-ton 10 cwt. 1-ton 10 cwt. 1-ton 10 cwt.

1-ton 10 cwt. 1-ton 10 cwt. 1-ton 10 cwt.

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1-ton 10 cwt. 1-ton 10 cwt. 1-ton 10 cwt.

1-ton 10 cwt. 1-ton 10 cwt. 1-ton 10 cwt.

1-ton 10 cwt. 1-ton 10 cwt. 1-ton 10 cwt.

Coal Tar Products:

| | | |
|--|--------|----------|
| Benzoic, 99 1/2% | 0 0 0 | per gal. |
| Carbolic Acid Crystals, 95% C | 0 0 6 | per lb. |
| " Liquid, 95 1/2% C | 0 0 4 | " |
| " Crude, 62 1/2% C | 0 1 0 | per gal. |
| Creosote, ordinary good liquid | 0 0 12 | " |
| Naphthalene, Crude 20% at 120° C | 0 0 1 | " |
| " Solvent, 35% at 100° C | 0 1 14 | " |
| " 50% at 100° C | 0 1 12 | " |
| " Rectified, flash point over 7° F | 0 1 12 | " |
| " Rectified, flash point over 100° F | 0 1 25 | " |
| Naphthalene all qualities | 1 0 0 | per ton. |

| | | |
|-------------------------------|--------|---|
| Copperas: Green in bulk | 0 12 6 | " |
| " Barrels | 1 18 6 | " |

| | | |
|-----------------------|---------|---|
| Copper Sulphate | 24 10 0 | " |
|-----------------------|---------|---|

| | | |
|------------------------------|--------|---------|
| Cyanides: 98%, minimum | 0 0 54 | per lb. |
|------------------------------|--------|---------|

| | | |
|--|--------|----------|
| Lead: Violet (Singer) White, English | 28 0 0 | per ton. |
|--|--------|----------|

| | | |
|-----------------|---------|---|
| " Foreign | 25 10 0 | " |
|-----------------|---------|---|

| | | |
|---------------|---------|---|
| " Brown | 20 10 0 | " |
|---------------|---------|---|

| | | |
|------------------------|--------|---|
| Litharge, Flakes | 27 0 0 | " |
|------------------------|--------|---|

| | | |
|----------------|---------|---|
| " Powder | 19 15 0 | " |
|----------------|---------|---|

| | | |
|-------------------------|--------|---|
| Red Lead, Genuine | 19 5 0 | " |
|-------------------------|--------|---|

| | | |
|-------------|--------|---|
| White | 20 0 0 | " |
|-------------|--------|---|

| | | |
|--|-------|----------|
| Naphtha (Wood): Mixture, 60 c.p. | 0 2 7 | per gal. |
|--|-------|----------|

| | | |
|-----------------|-------|---|
| " Solvent | 0 2 7 | " |
|-----------------|-------|---|

| | | |
|--------------------------|-------|---------|
| Potash: Bichromate | 0 0 3 | per lb. |
|--------------------------|-------|---------|

| | | |
|------------------------|---------|----------|
| " Carbonate, 90% | 16 15 0 | per ton. |
|------------------------|---------|----------|

| | | |
|------------------|---------|---|
| " Chloride | 18 12 6 | " |
|------------------|---------|---|

| | | |
|------------------|-------|---------|
| " Chloride | 0 0 3 | per lb. |
|------------------|-------|---------|

| | | |
|-----------------|---------|---------|
| " Muriate | 31 10 0 | per lb. |
|-----------------|---------|---------|

| | | |
|--------------------------|--------|---------|
| " Prussiate Yellow | 0 0 45 | per lb. |
|--------------------------|--------|---------|

| | | |
|---|-------|----------|
| Soda: Ash, Castile, 85%, Ordinary | 5 5 0 | per ton. |
|---|-------|----------|

| | | |
|-----------------|-------|---|
| " Refined | 6 5 0 | " |
|-----------------|-------|---|

| | | |
|-------------------------|--------|---|
| " Carbonated, 48% | 5 10 0 | " |
|-------------------------|--------|---|

| | | |
|---|--------|---|
| " Bleached, 88% (Ammonia), Alkali | 4 10 0 | " |
|---|--------|---|

| | | |
|-----------------------------|---------|---|
| " Castile, White, 75% | 10 12 6 | " |
|-----------------------------|---------|---|

| | | |
|-------------|--------|---|
| " 70% | 9 12 6 | " |
|-------------|--------|---|

| | | |
|--------------------|--------|---|
| " Cream, 60% | 8 10 0 | " |
|--------------------|--------|---|

| | | |
|---------------------------|-------|---|
| " Crystals, in bags | 3 0 0 | " |
|---------------------------|-------|---|

| | | |
|-----------------|-------|---|
| " Barrels | 3 7 6 | " |
|-----------------|-------|---|

| | | |
|-------------------------------------|--------|---|
| " Bicarbonate, in 1 cwt. kegs | 0 6 15 | " |
|-------------------------------------|--------|---|

| | | |
|---------------------|--------|---------|
| " Bicarbonate | 0 0 25 | per lb. |
|---------------------|--------|---------|

| | | |
|-------------------|--------|---|
| " Carbonate | 0 0 34 | " |
|-------------------|--------|---|

| | | |
|----------------|--------|----------|
| " Ntrate | 11 0 0 | per ton. |
|----------------|--------|----------|

| | | |
|-------------------|-------|---|
| " Phosphate | 9 5 0 | " |
|-------------------|-------|---|

| | | |
|----------------|--------|---------|
| " Potash | 0 0 35 | per lb. |
|----------------|--------|---------|

| | | |
|---------------------------------|--------|----------|
| " Silicate, solution, 10% | 4 10 0 | per ton. |
|---------------------------------|--------|----------|

| | | |
|----------------------------------|--------|---|
| " Sulphate (Glauber Salts) | 1 10 0 | " |
|----------------------------------|--------|---|

| | | |
|-----------------------|--------|---|
| " Sulphate, 90% | 1 15 0 | " |
|-----------------------|--------|---|

| | | |
|--------------------------|--------|---|
| Sulphur: Recovered | 4 15 0 | " |
|--------------------------|--------|---|

| | | |
|-----------------|--------|---|
| " Flowers | 6 15 0 | " |
|-----------------|--------|---|

| | | |
|---------------------|--------|---|
| Zinc Sulphate | 6 15 0 | " |
|---------------------|--------|---|

| | | |
|--|--------|----------|
| Shellac: Standard TN orange spot | 9 10 0 | per cwt. |
|--|--------|----------|

Minerals.

Messrs. S. W. Roysse and Co. quote:—

| | | |
|--|--------|----------|
| Barytes: Lump Calcinate, 99 1/2% | 1 10 0 | per ton. |
|--|--------|----------|

| | | |
|---------------------------------|--------|---|
| " Sulphate, 99 1/2% White | 2 15 0 | " |
|---------------------------------|--------|---|

| | | |
|---|--|--|
| China Clay: Of various qualities for all purposes; price from about 11 to about 20 per ton. Each China clay stock also kept at Ramoth and Poshon. Quantities given on invoice paid. | | |
|---|--|--|

| | | |
|---------------------------|--------|---|
| Chromite Ore: Basic | 1 10 0 | " |
|---------------------------|--------|---|

| | | |
|-----------------------------|--------|----------|
| Manganosulphate: Lump | 0 0 10 | per ton. |
|-----------------------------|--------|----------|

| | | |
|------------------------|--------|----------|
| Ochre: French II | 0 0 10 | per ton. |
|------------------------|--------|----------|

| | | |
|--------------------|--------|---|
| " French III | 0 0 10 | " |
|--------------------|--------|---|

| | | |
|-------------------|--------|---|
| " French IV | 0 0 10 | " |
|-------------------|--------|---|

Messrs. Henry Bath and Son quote:—

| | | |
|-----------------------------|--------|---------|
| Copper: Sheet of best | 1 10 0 | per lb. |
|-----------------------------|--------|---------|

| | | |
|------------------|-------------|---------|
| " Recycled | 0 11 10 1/2 | per lb. |
|------------------|-------------|---------|

| | | |
|------------------|-------------|---------|
| " Recycled | 0 11 10 1/2 | per lb. |
|------------------|-------------|---------|

| | | |
|---------------------|--------|---|
| Tin Ores, 90% | 8 16 0 | " |
|---------------------|--------|---|

| | | |
|---------------------|--------|---|
| Lead Ore, 70% | 7 11 0 | " |
|---------------------|--------|---|

| | | |
|-------------|--------|---|
| " 80% | 8 12 0 | " |
|-------------|--------|---|

| | | |
|-------------|--------|---|
| " 90% | 8 13 0 | " |
|-------------|--------|---|

| | | |
|-------------|--------|---|
| " 95% | 8 14 0 | " |
|-------------|--------|---|

| | | |
|--------------|--------|---|
| " 100% | 8 15 0 | " |
|--------------|--------|---|

Messrs. Barrington and Holt, Cartagena, quote:—

| | | |
|----------------------------|--------|----------|
| Iron Ore: | | |
| " On hand | 1 10 0 | per ton. |
| " Special top grades | 1 10 0 | " |
| " Extra quality do. | 1 10 0 | " |
| " Special Iron Ore | 1 10 0 | " |
| " Special 55% do. | 1 10 0 | " |
| " S.T. Compound Cast | 1 10 0 | " |

Manganiferous

| | | |
|------------|--------|----------|
| No 1 | 17 0 0 | per ton. |
| " 1B | 15 0 0 | " |
| " 2 | 12 0 0 | " |
| " 3 | 11 0 0 | " |
| " 4 | 10 0 0 | " |

Lead Ore:

| | | |
|--------------------------|--------|----------|
| " Batters ore | 1 10 0 | per ton. |
| " Linares sulphide | 1 10 0 | " |
| " Carbonate | 1 10 0 | " |
| " Iron pyrites | 0 10 0 | per cwt. |

Zinc Ore:

| | | |
|------------------|--------|----------|
| " Blende | 35 0 0 | per ton. |
| " Calamine | 72 0 0 | " |

N.B.—Any new tax that may be levied to be paid by buyers. Stocks of all classes of ore ready for prompt shipment.

Timber.

Messrs Alfred Dobell and Co. Liverpool, quote for wholesale quantities on c.i.f., Liverpool terms:—

| Timber. | £ s. d. | £ s. d. |
|------------------------------------|-----------------------------|---------|
| Quebec Square White Pine | per cwt. ft. 0 1 9 to 0 3 0 | |
| Quebec Waney White Pine | 0 2 8 to 0 3 0 | |
| S. John Pine, 12 in. average | 0 2 1 to 0 3 0 | |
| Lower Ports Pine | 0 1 7 to 0 1 8 | |
| Quebec Red Pine | 0 1 6 to 0 2 0 | |
| Quebec Oak, 1st quality | 0 2 0 to 0 3 4 | |
| Quebec Oak, 2nd quality | 0 1 6 to 0 2 6 | |
| Ash | 0 1 6 to 0 2 6 | |
| Elm | 0 2 3 to 0 4 0 | |
| Hickory | 0 2 0 to 0 2 6 | |
| Quebec Birch | 0 1 6 to 0 2 2 | |
| S. John Birch | 0 1 6 to 0 2 2 | |
| Birch Planks | 0 0 10 to 0 1 0 | |
| Spine Spars | 0 0 10 to 0 1 0 | |

Deals.

| | | |
|--|-----------------------------|--|
| 1st quality Quebec Pine | per cwt. 22 10 0 to 23 10 0 | |
| 2nd do. do. | 17 0 0 to 21 0 0 | |
| 3rd do. do. | 13 10 0 to 15 0 0 | |
| S. John, Miramichi, etc., Spruce | 2 15 0 to 8 0 0 | |
| Nova Scotia Spruce | 7 12 6 to 7 15 0 | |
| Spruce Boards | 6 15 0 to 7 0 0 | |

UNITED STATES, ETC. WOODS.

| Pitch Pine. | per cwt. ft. | per cwt. ft. |
|-----------------------|-----------------------------|--------------|
| Hewn | 0 1 6 to 0 2 0 | |
| Sawn | 0 1 6 to 0 1 10 | |
| Planks, Stowage | 0 1 0 to 0 1 7 | |
| Karri, Prime | per cwt. 16 10 to 18 10 0 | |
| Oak Timber | per cwt. ft. 0 1 6 to 0 2 0 | |
| Oak Planks | 0 1 0 to 0 2 1 | |
| East India Teak | per cwt. 17 0 to 20 0 0 | |
| Greenheart | 6 15 0 to 7 5 0 | |

EUROPEAN WOODS.

| Timber. | per cwt. ft. | per cwt. ft. |
|-------------------------------------|-----------------|--------------|
| Rice, B. Wood | 0 1 6 to 0 2 0 | |
| Dantz and Menel Fir, Crown | 0 1 6 to 0 2 6 | |
| Dantz and Menel Fir, Moulding | 0 1 9 to 0 1 10 | |
| Scandin | 0 1 9 to 0 1 10 | |
| Sawdust | 0 1 0 to 0 1 1 | |
| Rice, White Wood | 0 1 0 to 0 1 7 | |
| Norway Mining Timber | 0 0 9 to 0 1 0 | |
| Dantz and Menel Fir, etc. | 0 0 9 to 0 1 0 | |
| Norway Spars | 0 1 2 to 0 1 9 | |

Deals.

| | | |
|---|---------------------------|--|
| Red Ashland and Oregon, 1st quality | per cwt. 19 0 0 to 20 0 0 | |
| " do. 2nd quality | 14 0 0 to 16 0 0 | |
| " do. 3rd quality | 10 10 0 to 12 10 0 | |
| S. Brandenburg, 1st quality | 16 0 0 to 17 10 0 | |
| " do. 2nd quality | 14 0 0 to 15 0 0 | |
| " do. 3rd quality | 11 10 0 to 12 10 0 | |
| Weymouth | 11 0 0 to 12 10 0 | |
| 14 ft. 2 in. | 10 0 0 to 12 10 0 | |
| 14 ft. 2 in. | 11 0 0 to 12 10 0 | |

New Patents Applied For.

ENGINEERING—CIVIL, MECHANICAL, ETC.

- AIR PUMPS.**—J. Hoxby, Chesterfield. Improvements in air pumps for steam engines. 2,373.
- AUTOMATIC BRAKES.**—A. Matthew, Glasgow. Improvements in automatic brakes for screw pulley blocks, cranes and such like. 2,374.
- BOILERS.**—J. M. Thornton, Bristol. An improved method of circulating water in wet bottom cylindrical steam boilers. 2,402.
- BOILER TUBES.**—T. Patirath and G. Schuen, London. In improved machine for finishing boiler tubes. 2,724.
- CABLE GRIPS.**—R. H. Radford, Sheffield. Improvements in rope and cable grips and carriers for rope railways and tramways and the like purposes, and appliances connected therewith. 2,336.
- CLINKER CRUSHERS.**—F. L. Watson, Leeds. Improvements in machines for breaking up or crushing hot clinkers. 2,447.
- CONVEYOR BELTS.**—F. Reddaway, Manchester. Improvements in conveyor belts. 2,488.
- DESTRUCTORS.**—J. Giffin, London. Improvements in refuse destructors. 2,468.
- DRIVING BANDS.**—A. P. Escubos and J. Harker, Manchester. Improvements in the preparation of cotton and other driving bands and other bands, cords and ropes for use in the transmission of power. 2,482.
- EXHAUST STEAM.**—L. A. Hindley, London. Improvements in apparatus for rendering invisible the exhaust steam from a steam engine. 2,611.
- FAN DRIVING.**—J. Stone and Co., Ltd., and E. M. Preston, London. A new or improved method of driving fans, pumps, compressors and the like. 2,318.
- FEED WATER SUPPLY.**—J. E. L. Ogden, London. Improvements relating to the control of the feed water supply for steam boilers. 2,433.
- FIRE BOXES.**—J. J. Cartwright, Birmingham. Improvements in fire boxes for locomotives, stationary engines, and like purposes. 2,612.
- FURNACES.**—E. Brook, London. Improvements in furnaces. 2,713.
- FUSES.**—F. Krupp Akt.-Ges., London. Improvements in time fuses for projectiles. 2,513.
- GAS PRODUCERS.**—A. Go dwin, London. Improvements in suction gas producers. 2,217.
- GAUGE GLASSES.**—I. Walker, Leeds. Improvement in or in connection with water gauge glasses for steam generators. 2,654.
- GRATES.**—C. A. Allison, London. Improvements in water-cooled grates. 2,205.
- GRATES.**—I. L. Garsed, Halifax. Improvements in or relating to mechanically-operated grates or fire bars of furnaces. 2,404.
- GRINDING MACHINES.**—J. A. Cotes, London. Improvements in twist drill grinding machines. 2,543.
- HYDRAULIC TRANSMISSION.**—L. M. J. C. Levassieur, London. Improvements in hydraulic transmission devices. 2,117.
- LUBRICATOR.**—G. Beissbarth, Liverpool. An improved lubricator. 2,445.
- MANHOLE COVERINGS.**—H. R. Brain, London. A new or improved method of and means for covering manholes in boilers, tanks and the like. 2,529.
- PACKINGS.**—E. Immenten-Werk, "Kraatz" Co., Ltd., H. London. Improvements in and relating to piston-rod packings. 2,672.
- PISTONS.**—L. H. Rugg, London. Improvements in or relating to pistons for reciprocating engines. 2,428.
- PROTECTIVE LINING.**—N. G. van Huffel, London. Process for forming a protective lining on the interior surface of pipes. 2,435.
- PUNCHING MACHINES.**—A. Vernet, London. Improvements in and relating to punching machines. 2,332.
- ROLLER BEARINGS.**—J. Wahtola and J. Jette, 615 F Street, N.W., Washington, D.C., United States. Improvements in roller bearings. 2,417.
- ROTARY MACHINES.**—L. J. J. B. Le Rond, London. Improvements in or relating to rotary machines. 2,524.
- SCREW BOX.**—P. F. Smith, Sunderland. Portable screw box and feed for electric drilling machine. 2,494.
- SETTING SAW BLADES.**—E. Lajunias, London. Improvements in and relating to vices or apparatus for setting the blades of saws and the like. 2,219.
- SMOKE BOXES.**—H. Dent, London. Improvements in and relating to smoke boxes for locomotives and like engines. 2,532.
- SMOKE CONSUMING.**—J. P. McMahon, C. H. Potts, and J. W. Russell, London. Improvements in smoke-consuming apparatus for furnaces. 2,346.
- SPARK PREVENTOR.**—E. M. Goldstraw, Derby. Spark preventor. 2,264.
- SHEET IRON PILING.**—T. Larssen, London. Production of sheet-iron piling. 2,204.
- STEAM GENERATORS.**—F. X. Komarek, London. Improvements in steam generators. 2,628.
- SUPERHEATERS.**—P. Hermite, London. Improvements in steam superheaters for locomotives. 2,638.
- TOOL HOLDERS.**—E. I. Günther, Manchester. Improvements in tool-holders for lathes, planing machines and other analogous machine tools. 2,581.
- A. Herbert and P. V. Vernon, London. A tool holder and steady for use in turning bars or forgings in a turret lathe. 2,438.
- TURBINES.**—A. Greenwood and K. Anderson, London. Improvements in steam turbines. 2,361.
- The Warwick Machinery Company, Ltd., London. Improvements in and relating to elastic fluid turbines. 2,630.
- F. Roberts, Scarborough. Improvements in turbine motors. 2,267.
- VACUUM BRAKES.**—J. R. Jackson, London. Improvements in vacuum brake apparatus and the like. 2,715.
- WIRE DRAWING.**—W. Milner, Liverpool. Improvements in or connected with the lubrication of wire and dies in wire drawing machinery. 2,575.

ELECTRICAL.

- ALTERNATE CURRENT MOTORS.**—A. A. Eyler, London. Improvements in or relating to single-phase alternate current motors and generators. 2,467.
- ALTERNATING CURRENT.**—Siemens Bros. and Co., Ltd., London. An improvement relating to the introduction of electrical apparatus having magnetic cores or masses into alternating current circuits. 2,444.

New Publications.

"The Universal Electrical Directory"

(J. A. Berly's), 1906. H. Alabaster, Gatehouse and Co. Published in two forms, "A" containing the British and Colonial and General Sections only, price in the United Kingdom, 10s., and "B" containing the Continental and U.S.A. Sections in addition. Price 14s., carriage paid.

The well-known "Red Book," the oldest and largest of electrical directories, was published with the usual promptitude again this year. There is ample evidence that the directory has been carefully revised, and as far as possible, brought up to date. It contains the names and addresses of all the leading members of the electrical and allied trades and professions throughout the world. For facility of reference it is divided into four sections, as follows: British, containing 14,227 names; Colonial and general, containing 4,335 names; Continental, containing 7,938 names; U.S.A., containing 7,026 names—making a total of 33,526 names. Each of these sections is again divided into alphabetical and classified sections, and in the case of the British a geographical section is also given, by which a glance at any town shows all firms of any importance therein, the sections are indicated by a thumb index, which renders them perfectly easy of access. A strikingly useful feature of the book is the information regarding electricity works in Great and Greater Britain. The system of distribution and voltage are given, the engineer's name and capacity of plant, and in the case of alternating current, periodicity and phase are included. Telegraphic addresses and telephone numbers will be found in the alphabetical sections, and particulars as to capital, etc., of limited companies are given in the British Alphabetical Section.

"Practical Coal Mining."

A manual for managers, under-managers, colliery engineers, and others. By George L. Kerr, M.E., M.I.M.E. Fourth edition. Charles Griffin and Co. 12s. 6d.

A considerable amount of fresh data has been embodied in the new edition of Mr. Kerr's widely-read volume. Many of the illustrations which appeared in the previous issues have now been superseded by examples of more recent mining plants. The work is essentially for the practical man, the author, being a certificated colliery manager, knows just how to handle the many problems which, from day to day, confront the mining engineer in the course of his work. The book is well mapped out, and deals successively with sources and methods of coal, the search for coal, mining explosives, mechanical wedges, rock drills, coal-cutting by steam, transmission of power, mode of working, timbering roadways, winding coal, haulage, pumping, ventilation, safety lamps, surface arrangements, coal cleaning, surveying, levelling, and plans. It contains over five hundred figures and diagrams, and has been revised throughout.

Catalogues, &c.

The Abner Doble Company, of San Francisco, by way of commemorating the award of the Grand Prize at the Louisiana Exposition, have issued an allegorical design in photogravure. A draped figure of "Victory" is shown riding upon the runner of one of the firm's water wheels. Unfortunately, our sample has been marred in transmission, but enough of it is left to show that a very attractive design has been secured.

Sir W. G. Armstrong, Whitworth and Co., Ltd., Manchester.—The firm have recently issued a new and enlarged illustrated list of Whitworth standard thread screwing apparatus. Special attention is directed to the introduction of their new interchangeable "Guide" screw-stock and dies. It is suggested that these will be found extremely useful, as the dies can be easily renewed without the necessity for special fitting to a particular stock. The list also includes a large selection of other screwing tools required in engineering workshops. The new list cancels all previous price lists for screwing apparatus. A preliminary page reminds us that the angle of the "Whitworth" standard thread is 55 deg. and one-sixth of the height is rounded off, both top and bottom; the actual depth of the thread is thus equal to two-thirds of the height of the generating triangle, and is equal to $\frac{1}{6043}$ times the pitch.

Alex. Turnbull and Company, Limited, Bishopbriggs, Glasgow. have issued a beautiful well sheet with many illustrations of their patent safety boiler mountings, steam and water valves and other specialities. Attention is also called to the firm's new works and steam testing plant. The latter comprises two special steam boilers, one being a 50 h.p. boiler with a working pressure of 300 lb. and another boiler with a working pressure of 500 lb. per square inch. The hydraulic testing plant includes a triple set of hydraulic force pumps with accumulator and all accessories for testing up to 1,500 lb. per square inch. It is added, that a special machine is in daily use for testing the strength of metal from which castings are being made to withstand high pressures.

MEETINGS, ETC., FOR THE ENSUING WEEK.

FRIDAY, FEB. 10. Royal Institution, 8 p.m. Lecture, "The Passage of Electricity through Liquids," Mr. W. C. D. Whitham, Institution of Mechanical Engineers, Storey's Gate, S.W., 8 p.m. Annual General Meeting. Paper, "Large Locomotive Boilers," Mr. E. J. Charnward.

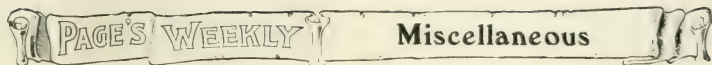
SATURDAY, FEB. 11. The Institution of Mechanical Engineers, Graduate Association, visit to Millwall Docks by invitation of Mr. M. M. McDermott, Chief Engineer, Framingham and District Electric Club at the Grosvenor Hotel, New Street, Birmingham. Paper on "The Production of Gas for Electric Lamps."

MONDAY, FEB. 12. The Institute of Marine Engineers, lecture on "Electricity," by Mr. H. E. Lusk. The Inner Institution of Engineers visit to the Electrical Laboratory of the Board of Trade, Richmond Terrace, Whitehall, at 2.30 p.m. and 7.30 p.m. See "Engineering" in April No. 52. William Webster, President, Institution of Modern Workingmen.

TUESDAY, FEB. 13. Institution of Civil Engineers, Great George Street, S.W., Mechanical, 8 p.m.

WEDNESDAY, FEB. 14. Society of Arts, 8 p.m.

THURSDAY, FEB. 22. Royal Society, Burlington House, at 4.30 p.m. Lecture, by Professor L. C. Bragg, at 8 p.m. "The Internal Architecture of Metals."



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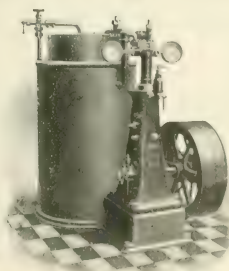
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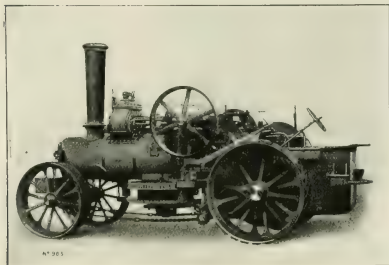
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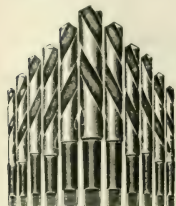
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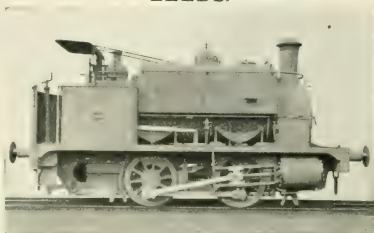
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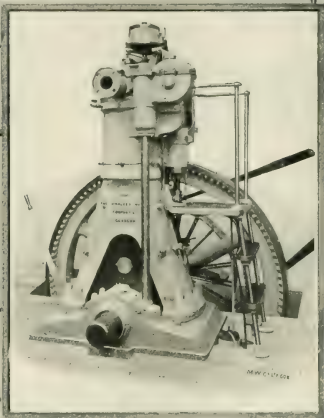
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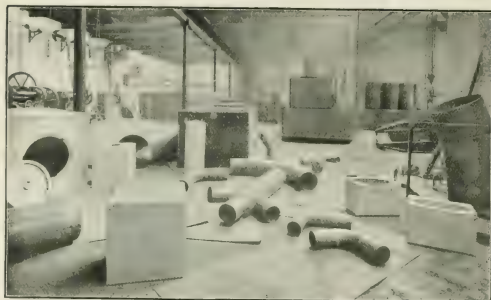
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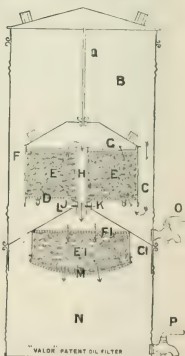
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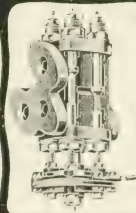
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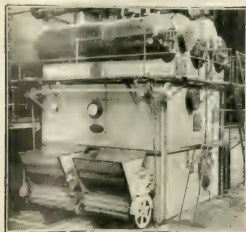
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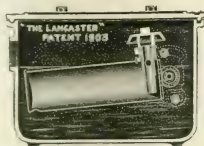
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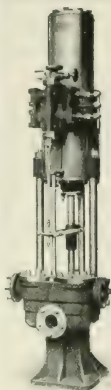
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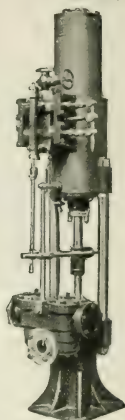
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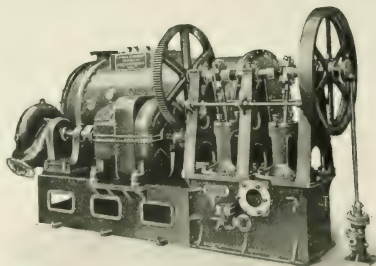
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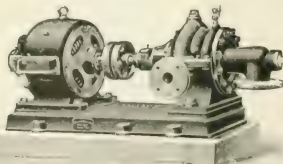
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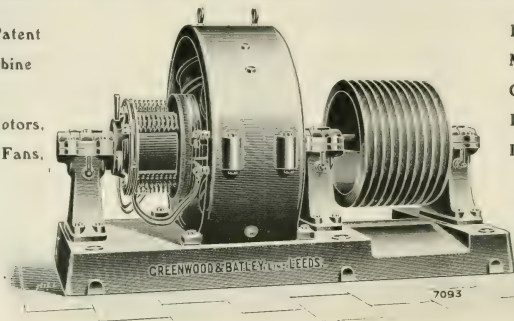
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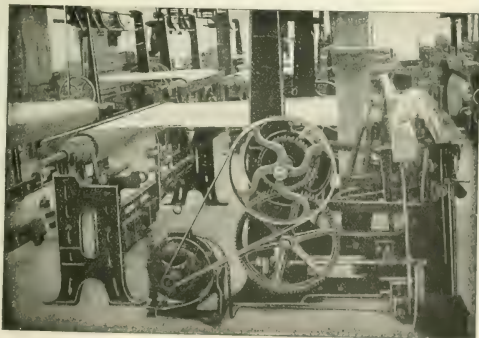
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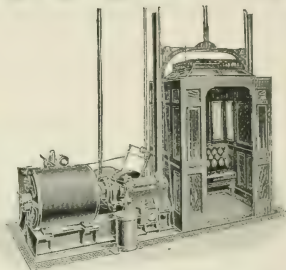
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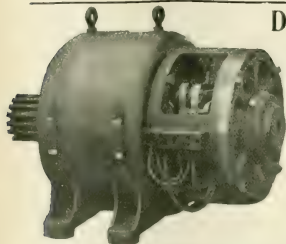
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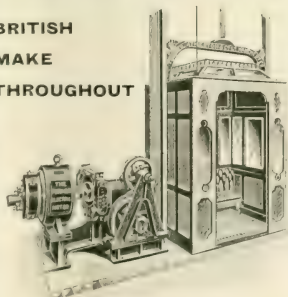
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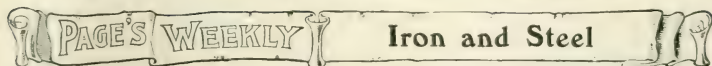
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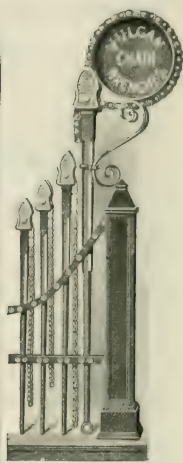


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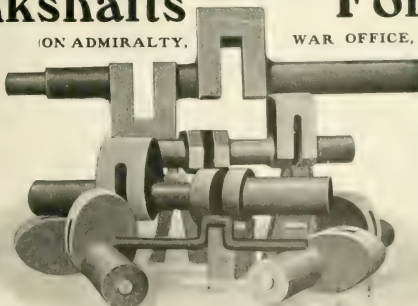
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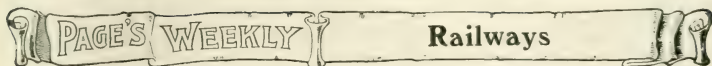
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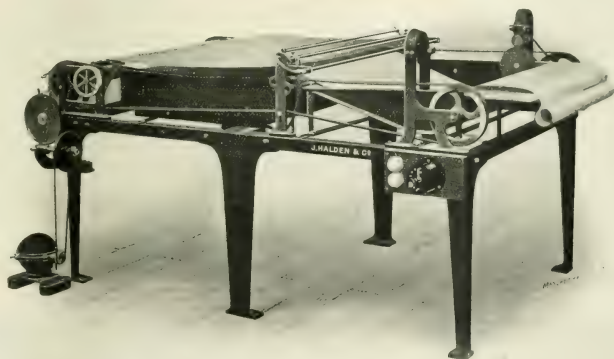
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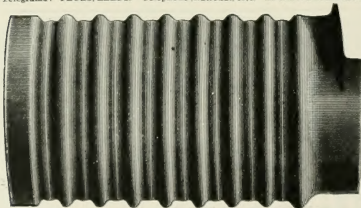
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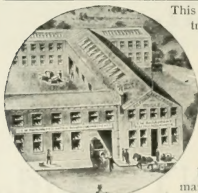
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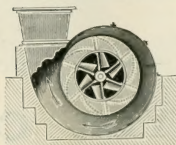
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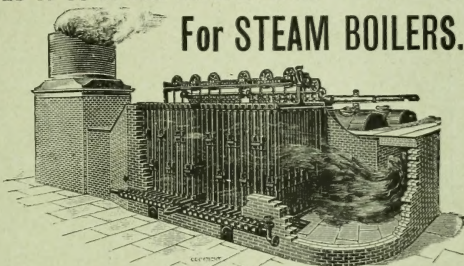
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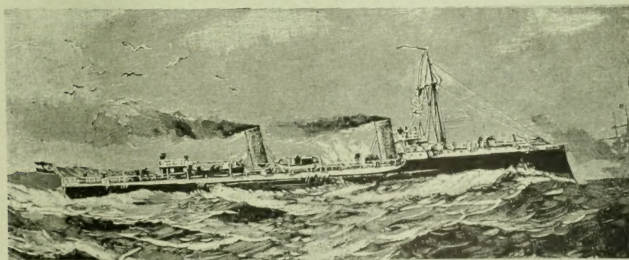
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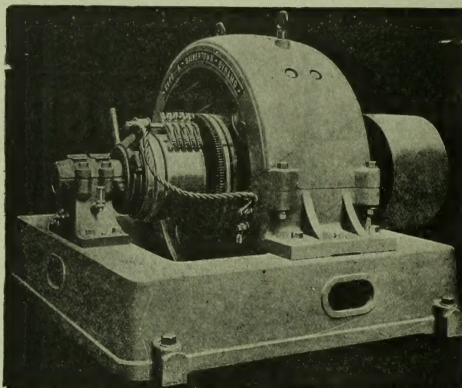
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